

APRIL, 1940

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SCIENCE-FICTION

A novel of the
end of the world

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"FINAL BLACKOUT" by L. Ron Hubbard

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LET'S MAKE IT STRONGER

PERHAPS that first invitation wasn't strong enough. We'll make it more definite. We want articles. We not only want them, we'll pay for them. There are, we understand, about a quarter of a million employed technicians and scientists in this country, most of whom, presumably, are not so overworked as to have no leisure time whatever, and a goodly number of whom, at least, have time to read *Astounding*. This is a direct invitation to those men to write articles.

Our proposition is this: We're willing to bet that the average electronics engineer is as much a layman to the average biochemist as is a corporation-law expert—yet the biochemist would probably go as far wrong in trying to define the difference between a grid potential and a space charge as the electronicist would in differentiating between an enzyme and a hormone.

Wherefore, we'd like to get articles from biochemists explaining the whats and whys of that specialty—what they're doing, and, even more particularly, what they are *not* doing, and why it is they aren't, though they'd very much like to. The headaches of the other poor sucker are always interesting because they aren't yours, but his triumphs are yours, because you're a man and a scientist, too.

What's out there at the boundary line between the known and the unknown? What are the hypotheses of science today? What do they predict—and what are they based on? Why can't they be proven, or what points of them can be checked, when the experiments are performed? What "physically impossible" things have been absolutely necessary for experiments, and how has the impossibility been dodged?

We want informal, accurate articles on every field of science. They aren't to be the dry-as-dust, scrupulously unemotional reports of technical literature, because, by all that's holy, an unemotional scientist isn't worth two hoots anyway. He's got to be interested in what he's doing, and determined to make that blasted pile of junk yield results, whether it wants to or not. If he doesn't get a thrill out of getting somewhere, why get there in the first place? The answer is, he probably won't.

I want articles that show that. I want a bull-session forum, where all sciences are represented, where not merely results, but hopes and beliefs can be presented, too. They must, of course, be designated as facts, theories and hypotheses—but they should be directed at those technical laymen who are interested, understand the scientific method, and—understand that even an adding machine has a sort of satisfaction in the thump it finishes up with when the problem's solved!

This invitation is extended to any and all practicing technicians in any and all fields. I'm not asking for yet-unpatented and unpublished material; I want material that's reasonably new, though. I want it directed to technically inclined minds, simply minds trained in other fields. We pay \$50.00 to \$60.00 for five to six-thousand-word articles. That's eighteen to twenty double-spaced, typed pages.

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THE EDITOR.

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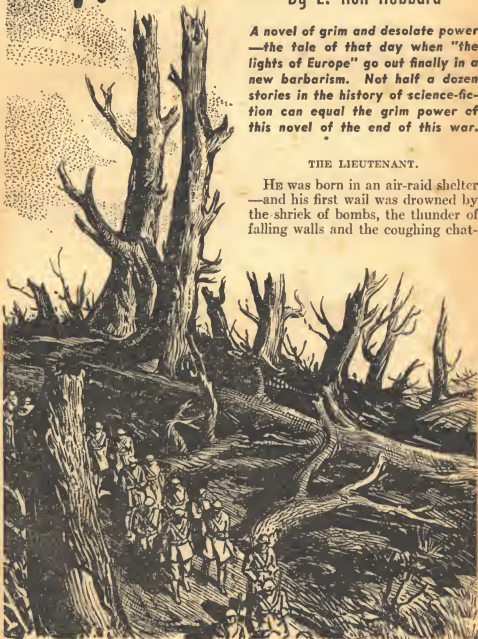
FINAL BLACKOUT

By L. Ron Hubbard

A novel of grim and desolate power—the tale of that day when "the lights of Europe" go out finally in a new barbarism. Not half a dozen stories in the history of science-fiction can equal the grim power of this novel of the end of this war.

THE LIEUTENANT.

He was born in an air-raid shelter—and his first wail was drowned by the shriek of bombs, the thunder of falling walls and the coughing chat-



ter of machine guns raking the sky.

He was taught in a countryside where A was for Antiaircraft and Z was for Zeppelin. He knew that the improved Vickers Wellington bombers had flown clear to Moscow, but nobody thought to tell him about a man who had sailed a carack twice as far in the opposite direction—a chap called Columbus.

War-shattered officers had taught him the arts of battle on the relief maps of Rugby. Limping sergeants had made him expert with rifle and pistol, light and heavy artillery. And although he could not conjugate a single Latin verb, he was graduated as wholly educated at fourteen and commissioned the same year.

His father was killed on the Mole at Kiel. His uncle rode a flamer in at Hamburg. His mother, long ago, had died of grief and starvation in the wreckage which had been London.

When he was eighteen he had been sent to the front as a subaltern. At twenty-three he was commanding a brigade.

In short, his career was not unlike that of any other high-born English lad born after the beginning of that conflict which is sometimes known as the War of Books—or the War of Creeds, or the War Which Ended War. Like any other, with the exception that he lived through it.

There is little accounting for the reason he lived so long and, having lived, moved up to take the spotlight on the Continental stage for a few seconds out of time. But there is never any accounting for such things.

When officers and men, sick with the hell of it, walked out to find a bullet that would end an unlivable life, he shrugged and carried on. When his messmates went screaming

mad from illness and revulsion, he gave them that for which they begged, sheathed his pistol and took over the fragments of their commands. When outfits mutinied and shot their officers in the back, he squared his own and, faced front, carried on.

He had seen ninety-three thousand replacements come into his division before he had been a year on the Continent. And he had seen almost as many files voided over again.

He was a soldier and his trade was death, and he had seen too much to be greatly impressed with anything. Outwardly he was much like half a million others of his rank; inwardly there was a difference. He had found out, while commanding ack-acks in England, that nerves are more deadly than bullets, and so he had early denied the existence of his own, substituting a careless cheerfulness which went strangely with the somber gloom which overhung the graveyard of Europe. If he had nerves, he kept them to himself. And what battles he fought within himself to keep them down must forever go unsung.

Before he had been a year on the Continent, the dread soldier's sickness had caused a quarantine to be placed on all English troops serving across the Channel, just as America, nine years before, had completely stopped all communication across the Atlantic. Hence, he had not been able to return to England.

If he longed for his own land, shell-blasted though it might be, he never showed it. Impassively he had listened each time to the tidings of seven separate revolutions which had begun with the assassination of the king, a crime which had been succeeded by every known kind of political buffoonery culminating in Communism. And he saw only

mirth in the fact that, whereas the crimson banner flew now over London, the imperial standard of the czar now whipped in the Russian breeze.

Seven separate governments, each attacked and made to carry on the war. Nine governments in Germany in only eighteen years. He had let the ribbons and insignia issued him drop into the mud, wishing with all his kind that all governments would collapse together and put an end to this. But that had never happened. The fall of one side netted attack from the organized other. And turn about. Just as the problem of manufacture had unequalized the periods of bombing, so had this served to prolong this war.

He knew nothing about these international politics—or at least pretended that he did not. He was, however, in close touch with the effects, for such a collapse was always followed by the general advance of the other side. The fall of his own immediate clique in command meant that he, as a soldier, would be attacked; the banishing of the enemies' chiefs caused him to attack in turn. But war, to him, was the only actuality, for never had he known of that thing men spoke of dreamily and to which they gave the name peace.

HE HAD SEEN, in his lifetime, the peak and oblivion of flight, the perfection and extinction of artillery, but only the oblivion and extinction of culture.

It had been three years since he had heard an airplane throbbing overhead. As a child, to him they had been as common as birds, if a shade more deadly. They had flown faster and farther and then, when the constant bombing of fuel bases

had rendered fuel impossible to procure—for national credit had long since died—he had seen the enemy raid his skies and escape unscathed. In turn, he had heard of raids upon an enemy, held fuelless, on the earth. The assembly of a new supply of petrol, or charcoal, or alcohol, and the condensing of a thousand partly undamaged ships into, perhaps, fifty that would fly, became the main concern of all governments. For, raiding perhaps once a year, they could inflict incalculable damage upon their grounded enemies. And war in the air had not become deadly until this phase was reached, for it was no longer war but slaughter, served and received times without number by all.

Once great guns had rumbled along definite lines. But big guns had needed artfully manufactured shells, and when the center of manufacture had become too disorganized to produce such a complex thing as a shell, firing had gradually sputtered out, jerkily reviving, but fainter each time until it ceased. For the guns themselves had worn out. And when infantry tactics came to take the place of the warfare of fortresses and tanks, those few guns which remained had, one by one, been abandoned, perforce, and left in ruins to a rapidly advancing enemy. This was particularly true of the smaller field guns which had hung on feebly to the last.

It had been four years since he had received his last orders by radio, for there were no longer parts for replacement. And though it was rumored that G. H. Q. of the B. E. F. had radio communication with England, no one could truly tell. It had been seven years since a new uniform had been issued, three years or more since a rank had been made for an officer.

His world was a shambles of broken townships and defiled fields, an immense cemetery where thirty million soldiers and three hundred million civilians had been wrenched loose from life. And though the death which had shrieked out of the skies would howl no more, there was no need. Its work was done.

Food supplies had diminished to a vanishing point when a power, rumored to have been Russia, had spread plant insects over Europe. Starvation had done its best to surpass the death lists of battle. And, as an ally, another thing had come.

The disease known as soldier's sickness had wiped a clammy hand across the slate of Europe, taking ten times as many as the fighting of the war itself. Death crept silently over the wastes of grass-grown shell holes and gutted cities, slipping bony fingers into the cogs of what organization had survived. From the Mediterranean to the Baltic, no wheel turned.

But the lieutenant was not unhappy about it. He had no comparisons. When lack of credit and metal and workmen had decreed the abandonment of the last factory, he had received the tidings in the light that artillery had never accomplished anything in tactics, anyway, Napoleon to the contrary. When the last rattling wreck of a plane had become a rusting pile of charred metal, he had smiled his relief. What had planes done but attack objectives they could not hold?

FROM the records which remain of him, it is difficult to get an accurate description of the man himself, as difficult as it is easy to obtain minute accounts of his victories and defeats. His enemies represent him as having an upsetting and even ghoulisn way of smiling, an expres-

sion of cheerfulness which never left him even when he meted death personally. But enemies have a way of distorting those they fear, and the oft-repeated statement that he took no pleasure in anything but death is probably false.

Such a view seems to be belied by the fact that he took no pleasure in a victory unless it was bloodless so far as his own troops were concerned. This may be accounted as a natural revulsion toward the school of warfare which measured the greatness of a victory in the terms of its largeness of casualty lists. Incredible as it may seem, even at the time of his birth, the mass of humanity paid no attention to strategic conquests if they were not attended by many thousands of deaths. But men, alas, had long since ceased to be cheap, and the field officer or staff officer that still held them so generally died of a quiet night with a bayonet in his ribs. And so the question may be argued on both sides. He might or might not be credited with mercy on the score that he conserved his men.

Physically, he seems to have been a little over medium height, blue-gray of eye and blond. Too, he was probably very handsome, though we only touch upon his conquests in another field. The one picture of him is a rather bad thing, done by a soldier of his command after his death with possibly more enthusiasm than accuracy.

He may have had nerves so high-strung that he was half mad in times of stress—and not unlikely, for he was intelligent. He might have educated himself completely out of nerves. As for England herself, he might have loved her passionately and have done those things he did all for her. And, again, it might have been a cold-blooded problem in

strategy which it amused him to solve.

These things, just as his name, are not known. He was the lieutenant. But whether he was madman and sadist or gentleman and patriot—that must be solved by another.

I.

THE BRIGADE huddled about two fires in the half dawn, slowly finishing off a moldy breakfast, washing down crumbs of rotted bread with drafts of watery, synthetic tea. About them stood the stark skeletons of a forest, through the broken branches of which crept wraiths of mist, quiet as the ghosts of thirty million fighting men.

Half hidden by the persistent underbrush were several dark holes; down awry steps lay the abandoned depths of a once-great fortress, garrisoned now by skeletons which mildewed at their rusty guns.

Though not yet wholly awake, the attitudes of the men were alert through long practice. Each man with half himself was intent upon each slightest sound, not trusting the sentries who lay in fox holes round about. Much of this tautness was habit. But more of it, today, had direction. A night patrol had brought word that several hundred Russians occupied the ridges surrounding this place. And the brigade which had once been six thousand strong now numbered but a hundred and sixty-eight.

They were a motley command: Englishmen, Poles, Spaniards, Frenchmen, Finns and Italians, uniformed in the rags of twenty nations, friend and foe alike. They were armed with a catalogue of weapons, the cartridges of one seldom serving the rifle of another. They were clothed and armed, then,

by the whim and experience of each.

In common they had endless years of war behind them. In common they had the habit of war. Long since the peasants of the armies had slid over the hill, back to devastated farms and fields, leaving only those who had but one talent.

The English could not, because of the quarantine against soldier's sickness, go home. Once they had had sweethearts, wives and families. But no one had heard for so long—

They had survived whole divisions of replacements. They had been commanded by more officers than they could count. They had been governed by more creeds than they could ever understand.

Here was their world, a shattered wood, an empty fortress, a breakfast of crumbs and hot water, each man hard by his rifle, each existing for the instant and expecting the next to bring danger and death.

These were the unkillables, immune to bullets, bombs and bugs, schooled in war to perfection, kept alive by a seventh and an eighth sense of danger which could interpret the slightest change in their surroundings and preserve themselves from it.

Having lost all causes and connections, having forgotten their religions, they still had one god, their lieutenant. He was, after all, a highly satisfactory god. He fed them, clothed them and conserved their lives—which was more than any other god could have done.

Now and then eyes wandered to the lieutenant and were quieted by the sight of him. For, despite all danger, the lieutenant was sitting upon the half-submerged wheel of a caisson, shaving himself with the help of a mirror stuck in the crotch of a forked stick.

The cook came up with a kettle

of hot water which he emptied into the old helmet which served the lieutenant as a washbasin. The cook was a lean fellow of rather murderous aspect, wholly unwashed and hairy and carrying a naked bayonet thrust through his belt.

"Can I get the lieutenant anythin' else, sir?"

"Why, yes. A fresh shirt, an overcoat, a new pistol and some caviar."

"I would if them Russians had any, sir."

"I've no doubt of it, Bulger," smiled the lieutenant. "But, really, haven't you something a bit special for breakfast? This is an anniversary, you know. My fifth year at the front was done yesterday."

"Congratulations, lieutenant, sir. If you don't mind my mentioning it, are you goin' to start the sixth year with a fight?"

"Ho!" said a rough voice nearby. "You'll be advising us on tactics next. Stick to your foraging, Bulger." And Pollard, the sergeant major, gave the cook a shove back toward the fire. "Sir, I just toured the outposts and they been hearin' troops movin' on the high ground. Weasel is out there and he claims he heard gun wheels groanin' about four."

"Gun wheels!" said the lieutenant.

"That's what he said."

The lieutenant grinned and rinsed off his face. "Some day a high wind is going to catch hold of his ears and carry him off."

"About them Russians, sir," said Pollard, soberly, "are we just going to stay here until they close in on us? They know we're down here. I feel it. And them fires—"

Pollard was stopped by the lieutenant's grin. He was a conscientious sergeant, often pretending to a sense of humor which he did not possess. No matter how many men

he had killed or how terrible he was in action, his rugged face white with battle lust, he shivered away from ridicule at the hands of the lieutenant. In his own way he respected the boy, never giving a thought that his officer was some twenty-three years his junior.

The lieutenant slid into his shirt and was about to speak when the smallest whisper of a challenge sounded some two hundred yards away. Instantly the clearing was deserted, all men instinctively taking cover from which they could shoot with the smallest loss of life and the greatest damage to the foe. There had been a note of anxiety in that challenge.

The lieutenant, pistol in hand, stood with widespread boots, playing intelligent eyes through the misty woods. A bird call sounded and the camp began to relax, men coming back to their fires and again addressing their synthetic tea.

AFTER a little, as the call had indicated, an English officer strode through the underbrush, looked about and then approached the lieutenant. Although a captain, he was dressed in no manner to indicate his outfit. Like the lieutenant, he had amalgamated the uniforms of some four services into an outfit which was at least capable of keeping out the wet.

"Fourth Brigade?" he questioned.

"Right," said the lieutenant. "Hello, Malcolm."

The captain looked more closely and then smiled and shook the extended hand. "Well, well! I never expected to find you, much less get to you. By the guns, fellow, did you know these ridges are alive with Russians?"

"I suspected so," said the lieutenant.

ant. "We've been waiting three days for them."

Malcolm started. "But . . . but here you are, in a death trap!" He covered his astonishment. "Well! I can't presume to advise a brigade commander in the field."

"You've come from G. H. Q.?"

"From General Victor, yes. I had the devil's own time getting to you and then finding you. I say, old boy, those Russians—"

"How is General Victor?"

"Between us, he's in a funk. Ever since the British Communist Party took over London and executed Carlson, Victor hasn't slept very well."

"Bulger," said the lieutenant, "bring the captain some breakfast."

Bulger lumbered up with a whole piece of bread and a dixie of tea which the staff officer seized upon avidly.

"Not much," said the lieutenant, "but it's the last of the supplies we found cached here in this fortress. Eat slowly, for the next, if any, will have to be Russian. Now. Any orders?"

"You're recalled to G. H. Q. for reorganization."

The lieutenant gave a slight quiver of surprise. "Does this have anything to do—with my failure to comply with the B. C. P. Military Committee's orders to appoint soldiers' councils?"

Malcolm shrugged and spoke through a full mouth and without truth. "Oh, no. Who'd bother about that? I think they wish to give you a wider command. They think well of you, you know."

"Then—" said the lieutenant, knowing full well that a recalled officer was generally a deposed officer.

"It's the general's idea. But, see here, those Russians—"

"I'll engage them shortly," said the lieutenant. "They're fresh and they ought to have boots and bread and maybe something to drink. My favorite listening post, a chap named Weasel, said he heard wheels last night."

"Right. I was going to tell you. I saw a trench mortar and an anti-tank rifle—"

"No!"

"Truth," said Malcolm.

"Artillery!"

"No less."

"Well, I'll— Why, there hasn't been a field piece on this front since the storming of Paris two years ago. Have they got shells, do you suppose?"

"They had caissons."

"And—say! Horses!"

"I saw two!"

The lieutenant beamed happily. "Ah, you've come just in time. Roast horse. Think of it! Brown, sizzling, dripping, juicy horse!"

"Horse?" said Bulger, instantly alert although he had been a hundred feet and more away.

The brigade itself looked hopeful; they moved about through the naked starkness of the trees and tried to catch sight of the Russians on the heights.

THE EVENT WAS, to say the least, unusual. And the thought of food momentarily clogged Malcolm's wits. In light of what he was trying to do, he would never have made such a statement. "It's been a long time since I've had a decent meal of anything. Much less horse."

The lieutenant caught at the remark. There was no sympathy between field officers and staff officers, for, while the former fought and starved, the latter skulked in the protection of impregnable G. H. Q.



*"No . . . no! Oh, God, man, it's gas. I tell you! Gas—
not the Sickness—"*

Coldly the lieutenant fired and watched him settle down—

and received occasional rations from England, existing between times on condensed food stored in times past for many more men than were now left alive. That a staff officer had risked this trek in the first place struck the lieutenant as being very odd.

"What's up?"

Malcolm realized then, possibly from the sharpness of the tone, that he had done wrong.

"What's up?" repeated the lieu-

tenant insistently.

Malcolm put a good face on it. "I shouldn't tell you, but we're out of touch with England. There's been no food for three months."

"That isn't all you can tell me."

Malcolm squirmed. "Well, if you'll have it. G. H. Q. is recalling all field troops. General Victor is thinking of withdrawing from our present base into the south where there may be some fertile area. It will be better for all of us." Syco-

phant that he was, he sought to allay further questioning. "I was sent expressly to get you. Your ability is well known and appreciated, and Victor feels that, with you guiding operations, we cannot fail."

The lieutenant brushed it aside. "You're telling me that England—no, not England but those damned Communists there—have forbidden us ever to return."

"Well—the quarantine did that."

"But it left room for hope," said the lieutenant.

Malcolm was silent.

"They're afraid," said the lieutenant. "Afraid we'll come back and turn their appetite over dixie." He laughed sharply. "Poor little shivering fools! Why, there aren't ten thousand British troops left in the world outside of England. Not one man where there was once a thousand. We've battered French and German and Russian and Italian and German again until we're as few as they. We're mixed up with fifty nationalities, commanded by less than a hundred officers, scattered from Egypt to Archangel. Ten thousand men and ten million, twenty million graves. A whole generation wiped out by shot and starvation and sickness. And they're afraid of us in England!"

It had its effect upon Malcolm. He had been out only two years. For a moment he forgot his fear of a field officer, remembering instead a certain girl, weeping on a dock. "I'll get back some way. It's not final. I'll see her again!"

"Not under Victor, you won't."

"Wait," cautioned Malcolm, afraid again. "He's your superior officer."

"Perhaps," and in that word Malcolm read direful things.

"But you'll obey him?" said Malcolm.

"And go back to G. H. Q.? Certainly."

Malcolm sighed a little with relief. How dull these field officers were at times! Didn't they ever hear anything? But then, thirty or more outfits had innocently obeyed that order, little knowing that they would be stripped of their commands immediately upon arrival and asked to be off and out of sight of the offended staff. But, no, the lieutenant would not understand until the whole thing was over. There was nothing unreasonable in this to Malcolm. Importance now was measured only by the number of troops an officer commanded. It was not likely that the staff would leave mutinous field officers at the head of soldiers and thus menace the very foundation of the general staff.

"They've had their way in England," said the lieutenant. "Yes. They've had their way."

Malcolm was troubled again. He quickly redirected the lieutenant's line of thought. "It will be all right when we have a new post. We'll carve out a large section of fertile country and there'll be food enough for all."

"Yes?" said the lieutenant.

Malcolm could read nothing from that at all. He shivered involuntarily, for he had heard strange tales from out of the darkness of the front.

"What's this?" said the lieutenant. "Fever? Carstone! Draw a drink off that Belgian alcohol machine gun and give it to Captain Malcolm."

"Thanks," said Malcolm, affected.

THE LIEUTENANT got up and stretched. To look at him one would not suspect that he had been starved his entire life, for his body was firm and healthy. He had been born into hardship and he had thrived upon it. He smoothed out his blond hair

with his fingers and set an Italian duriron helmet upon his head. He shrugged into his tunic and buckled his belts. Out of habit he checked over his automatic, examining each bullet in the three clips.

Mawkey, a little fellow with a twisted spine and a set of diabolical eyes, who usually waited upon the lieutenant, came forward with a rag and wiped the lieutenant's boots. Then, from a broken limb he took down the bullet-proof cape which had been captured from a Swiss nearly four years ago. It was inch-thick silk, weighing almost thirty pounds in itself and weighted further by the slugs which had lodged in it and which could not be cut out without ruining it. Mawkey fastened it about the lieutenant's shoulders and then began to pack the shaving effects into a gas-mask container.

"Where have you been?" said the lieutenant.

"I took a personal scout," said Mawkey, pointing to his superfine eyes, the best in the brigade. He grinned evilly. "Russians begin to move about daylight; they creep down ravines toward here. I see officers on hummock up there." He pointed to an exposed hill. "See them?"

"No."

"Just a cap here and there."

"The officers, you say?"

"See! The sun hit a field glass!"

"I didn't but we'll take your word."

"Good Heaven, man," said Malcolm, "you're not just going to sit here and wait for them!"

"Why not? Would you have us charge across the open at men with artillery?"

"No, but—"

"Take it easy," said the lieutenant. "Sergeant, bring all but two posts in.

Be ready to march in ten minutes."

"Yessir."

"March?" said Malcolm. "But where?"

A sentry came wriggling out of the brush and ran to the lieutenant. "I zee seex, seven Russian patrol come." And he pointed west.

And an instant later two more sentries came in breathlessly, pointing to the south and the east. The Russian post of command had already been indicated in the north.

"You're caught!" said Malcolm. "They've spotted you by your fires!"

"Bulger, throw on a few green sticks to make more smoke," replied the lieutenant. "Have you got all the wrong-caliber ammunition, Pol-lard?"

"And some from the fortress down there, sir."

"Good. Put a squad to work gathering all the dry wood in sight. Stand by to throw it on the fires. Carstone, better check your pneumatics."

"Yessir."

"Yessir."

"Tou-tou, stand by to head the rear guard and pick your men."

"Yess, yess, mon lieutenant."

"Good Heaven, old boy!" said Malcolm. "Of what use is a rear guard when there is nowhere to retreat? Oh, yes, I know. I'm steady. But every time I see one of you field officers preparing a defense or attack, I get a headache. You aren't according to the book, you know, not at all. I say, how fine it would be to have some artillery ourselves."

"Worthless stuff."

"Eh?"

"If I had an antitank rifle and a trench mortar, what would be the result? Lord, didn't they prove that years ago? One side cancels out the damage of the other by inflicting just as much. Chap called Napoleon

brought artillery into style, or so these French tell me. Absolutely useless stuff except for pounding down a wall. As useless as airplanes. Too many casualties and grief for too little fun."

"Fun?"

"Why not? Herrero, give Bulger a hand with his kettles."

The camp was boiling with efficient activity. Carstone's crews were hard at work upon the pneumatic machine guns. Once they had been run by gasoline with the hand compressors as auxiliary. But now there was only the auxiliary. Four men were priming them to full load while Carstone checked their battered gauges. Born out of the problem that a machine gun is always located by its noise, the pneumatics had stayed to solve the problem of scanty ammunition, for they fired slugs salvaged from British issue in which the powder had decayed. And there were plenty of such dumps.

The lieutenant paced about the clearing, checking up, watching for the last posts to come in and the first Russian to appear.

And then the Weasel popped up, yelling, "Shell!"

An instant later everyone heard it and then saw it. It was a trench mortar, tumbling down the sky. Somebody, having pity for a man who had never seen one, bore Malcolm backward into cover of the caisson. The bomb struck and exploded, directly in the center of the clearing. Shrapnel screamed wickedly as it tore through the already-maimed trees.

II.

IN THAT SHOWER of death it seemed preposterous that any of the hundred and sixty-eight could have escaped, for the trench mortar was of very large caliber. But the frag-

ments had barely ceased screaming when men again populated the clearing. A swift survey showed that only a kettle and a pack had suffered and the latter but slightly.

"Tou-tou!" said the lieutenant. "Take cover in that passage mouth to cover us."

"Yess, yess, mon lieutenant."

"Double file, follow me!" cried the lieutenant, striding to the top of the largest entrance of the fortress. At the top he paused. "All right. Quickly. Down with you." And he passed his hurrying men by him and below with a gesture.

A shrill piping, growing stronger, again cleared the place as though by magic. The three-pounder blazed out and shrapnel again hammered the wood. But the men were up and hurrying through its smoke before branches had ceased to fall.

"Pollard!" said the lieutenant.

"Yessir," replied the sergeant major.

"Give a hand. Get down below there, Malcolm. We're all right. All below, now."

With the sergeant's help the lieutenant began to pile the dry brush upon the fire. Mawkey, in the entrance, yelled, "Mortar!"

It burst almost on the fire.

The lieutenant and Pollard slipped out from behind cover and completed the piling of the brush. Then, with the boxes supported between them, they began to empty two hundred pounds of assorted and cast-off bullets through the brush pile.

"Shell!" howled Mawkey.

The piping ended in a roaring flash. The top of a tree leaned slowly over and then plummeted to earth. The lieutenant, up again, pulled the glass visor of his Italian helmet down over his face and wrapped his cloak tightly about him.

"Get down with our people there!" he shouted to Pollard.

The sergeant was reluctant, but he obeyed. By now, because of the pauses caused by the shells, a few of the cartridges were beginning to explode in the brush pile. Slugs occasionally made the silk cloak whip up about the skirt. The lieutenant emptied the last box and dived down into the entrance.

Behind them a slow firing had commenced to mount in volume.

The lieutenant lifted his visor and thrust through the crowd which was huddled in the outer chamber. He raised his hand in the honored signal to follow him and plunged off along a corridor. The pavement was very uneven, broken up by roots. Here and there steel beams in the roof had rusted through to let down piles of rubble. About a hundred and twenty yards up the line they passed a barrack in which tier upon tier of collapsed bunks still held the skeletons of men who had been caught by the direct hit of a gas shell. Above, on another level, the twisted and corrosion-congealed remains of big guns stood like prehistoric monsters, forgotten by time.

From observation slots along the way, sheets of light came through, flicking along the passing column.

"I didn't know any of these were left," said Malcolm in an awed voice. "I'd heard about them being used once— How many dead there are here!"

"Fortress fever, mutinies— Toward the last the pioneers had a trick of lowering gas grenades through the observation slots from above."

Malcolm tripped over a sprawled human framework and a shaft of light caught in the gold of medals as they tinkled down through the ribs. He hurried on after the lieutenant.

There were whispers about them as the few surviving rats hid from them, rats once bold enough to attack a sleeping man and tear out his eyes before he could awake.

THE COLUMN moved quietly. Long ago they had discarded the last of their hobnails, for these had a habit of scraping against stones and giving a maneuver away. They kept no step or order of march, for each, as an individual, had his own concern, his own method of caring for himself, and so they strung out far. Even though it had been years since such a fortress had been garrisoned by any of them, they instinctively took precaution against direct hits on the tunnel roof above them.

The tunnel dipped and, for a little way, they sloshed knee-deep in water. Shaggy Corporal Carstone, in charge of the machine-gun company, clucked like a mother hen as he got his precious charges over the rough places; for while water could do no harm, the tanks were so worn and thin that one stumble might put them out of action, filled as they were with their full weight of air.

Now and then the lieutenant struck his flint to find a chalk mark on the wall and thus determine the right turn, and Malcolm began to realize that the place had been recently mapped. Malcolm, following the shadow of the cloak, was struck by the expression which each flint flash revealed upon the lieutenant's face. For the lieutenant had a twinkle in his eye and a sardonic smile upon his lips, as though he was hugely enjoying this business.

Malcolm's ear caught the sound of firing each time they passed an observation slot, and it began to come to him that the cartridge-filled brush was burning gradually, thus acting as a time fuse on the

bullets. In truth it sounded as though the clearing far back was bitterly defended. He eyed the lieutenant with renewed respect. But for all that the lieutenant was not a known quantity to him. None of these scattered officers were. They seemed to be without nerves, impervious to all anxiety, able to subsist upon nothing. He had heard something of the officers of yesterday; how they had driven unwilling troops with a drawn pistol and a lash, how they had carried out the stupid orders which always led to slaughter against heavily fortified objectives. He had heard, too, that many an officer had been found with a bullet in his back. But that was yesterday, a yesterday a fifth of a century dead. A yesterday when prisoners had been shot to avoid giving them rations, when every slightest spark of gallantry had been swallowed in the barbaric lust of battle which had swept the Continent as madness might sweep through a pack of dogs.

It was not that the lieutenant was kind. He merely did not care. His men did not belong to a government but to himself. It seemed that all men with nerves had died of them, leaving a strange corps of beings above such things as human weakness and death, men who had evolved for themselves a special art of living. Malcolm had no hopes for the mercies of the lieutenant; they did not exist. And he was thinking to himself, following that cape, that the race of fighting men, while laudable in many ways, had degenerated in others. Their love of battle was quite finished and bravery was a word. For what better evidence could he have than this fact of the lieutenant's running away from a force because it had field pieces?

A question annoyed Malcolm. They were outward bound from the last encampment. But had they any destination? What would they do for food?

AHEAD a hazy blur of light became apparent. Weeds had choked the exit from the fortress, and the roof had fallen until it was necessary to crawl belly down on the rubble to get out.

The lieutenant made a cautious survey. Ahead stretched an indistinct trench which had once communicated with the rear. It had been dug in a sloping ravine which fell away to the north. They had come through the hill on which the Russians had established their P. C. Stepping aside, the lieutenant passed his men out. Hardly a shrub waved to mark their presence in the trench. They did not group, but faded into cover until a very small space, apparently quite empty, actually contained the whole force.

"Pollard, take the east slope," whispered the lieutenant. "Tou-tou—where are you?"

"Here the same, mon lieutenant," said Tou-tou, crawling out.

"You waited for contact?"

"Yess, mon lieutenant. Zey are sso young, so many."

"Very well. Take the west slope. Work up toward the crest and in one half hour by the sun you will hear our signal to attack. Carstone, wait here in case there is any firing from above and cover our retreat if necessary. If we are successful, come up quickly with your guns. Weasel, locate their baggage; take six men and be very quiet when you take the sentries."

"Right, sir."

"Pass the word. First Regiment with Pollard, Second with Tou-tou, Third with me. Remember, only

bayonets. And do not kill their commander or the staff."

The word was passed like a gentle draft of air. Then Pollard was gone and a third of the brigade melted away. Tou-tou's third vanished without a sound. The lieutenant thrust a stick into the earth to watch its shadow. The sun was still very low and the mist over the valleys had not wholly burned away. From over the ridge came the clatter of rifle fire and the occasional dull thump of grenades.

Presently the lieutenant signaled with his hand and slid out of the trench and through the underbrush toward the crest. Malcolm stayed by Carstone.

Spread thin, the Third Regiment slithered silently upward. They could not yet see the crest, for the way was long and there were several false ridges. This hillside was very uneven, pock-marked with shell holes now very indistinct. Everywhere before the advance rabbits scurried and dived into cover. They were avoided by the soldiers for the reason that they carried a deadly sickness, and though all were probably immune, it was not good to take chances. Only the birds with which the Continent now teemed were good prey, but the soldiers were so nauseated by their meat by now that they seldom took the trouble to set snares.

A squeal, scarcely started before it was stopped, told of some providential soul picking up a pig of the type which had long forgotten its domestication. These were too rare to be overlooked, but First Sergeant Hanley, a tough Scot nominally commanding the Third Regiment, went slipping off on a tangent to reprimand the act.

Mawkey, who had scuttled ahead, came back now, his evil eyes bright

with excitement. "They all face south. There are about six officers and a guard of thirty soldiers. The artillery is over to your right in an old field-gun emplacement."

"Gian," whispered the lieutenant to an Italian sergeant with a perpetually hungry look, "take a company over and stand ready to squash the gunners between Tou-tou and yourself when he comes up."

"Si," bobbed Gian. "I hope they have rations."

"Who ever heard of a Russian who had anything to eat?" said the lieutenant. "On your way."

Gian was there and then wasn't there. Aside from the distant firing, there was no sound. The battery above had ceased to bellow some time ago, being uncertain of the positions of its own troops.

THE LIEUTENANT glanced at the sun and then thrust another stick into the center of a flat place and measured the shadow with the spread of his hand just to be sure. He had three or four minutes left of the half-hour. He pulled down the visor over his face and the men near him did the same. There was a slight snicking sound as firing mechanisms were checked and bayonets tested.

More slowly now the lieutenant brought them forward. Mawkey, at his side, was trembling with eagerness as he unrolled his favorite weapon—a stick to which was attached three lengths of light chain appended by choicely sharp chunks of shrapnel.

They were almost to the crest now, so flat in the tall grass that they were still invisible to the Russians. The lieutenant checked the sun. He whistled the trill of a meadow lark three times, paused and then whistled it again.

There was a yelp of terror, hacked

off short, over by the battery. A second later the grass all about the P. C. erupted with soldiers. A Russian officer emitted a hysterical string of commands and the thirty men whirled about to be drowned in a sea of charging men. Two or three guns went off. The crew of an alcohol machine gun valiantly tried to slew about their weapon and then, seeing it was no use, tossed down their sidearms.

The commander was a young man of very severe aspect. He started to roar his complaint and then, seeing a way out, leaped toward the lip of the ridge. Mawkey's weapon wrapped about his legs and he went down. Ruefully he disentangled the weapon and began to massage his shins.

It was all over before the dust had had a chance to rise. Thirty prisoners, one slightly wounded, were disarmed. Tou-tou came up with the battery crew and reported that Gian was manning the field pieces, which were six, not two.

"No casualties," reported Tou-tou, grinning.

Pollard, who had been a little tardy, thanks to an unforeseen ravine, was cross. A runner came up from the Weasel to report that all baggage was in hand, but that the Russians had surrendered upon seeing themselves outpointed.

The lieutenant took off his visored helmet, for it was very hot in the sun, and handed it with his cloak to Mawkey, taking the remnant of a British flying cap in return. Now that the Russian commander had regained his composure, the lieutenant called attention to him with a bow.

"I am indebted to you, sir."

The commander, who spoke fair English, bowed in his turn. "I have

been outmaneuvered, sir. I congratulate you."

"Thank you. Now hadn't we better recall your troops before they squander all their ammunition on a pile of brush filled with bullets?"

The commander blinked and then recovered, smiling. "So that was the trick."

"That is the center of an old fortress system," said the lieutenant.

"I did not know the region."

"Which could hardly be expected. We waited for you for three days."

"I apologize for my underestimate of the troops here. We were sent out some three months ago to carve our way through to the sea and inspect the region in the hope that food can be shipped inland from here."

"There is no food," said the lieutenant. "In fact, if you can forgive such sentiment, we attacked you solely because we were informed you had horses."

"Ah," said the commander, understanding. He turned and rattled an order to an aid who stood by to hoist a recall flag upon further command.

"ABOUT the terms," said the commander, "I trust that you follow the custom of these days."

"All prisoners disarmed and released and all impersonal baggage retained."

"Sir, although I dislike having to ask further forbearance from a man I respect, I hope you will allow us to retain our arms. The country through which we have passed is filled with roving bands of soldiers."

"Of course, you will give me your parole," said the lieutenant, "and swear on your honor as an officer to return to your center of government?"

"Certainly. You, perhaps, can give me the data we wish."

"Certainly. And now pardon me. Pollard, man that alcohol gun and send word to our battery to stand by. Have Weasel bring up the baggage train to that ravine below there. Your troops," he said, turning back to the commander, "will be left in possession of their rifles and ammunition. We shall retain the battery and animals and all impersonal baggage."

"Thank you," said the commander, giving the signal to hoist the recall. "We shall begin our return at noon. You wish my troops to remain there in the valley, of course, until they march?"

"Naturally."

"And you say there is no fertile region between here and the sea?"

"On my honor I know of none. England has exhausted herself and is of no value, and I dare say your own country is in like condition."

"Well— Sir, may I be frank?"

"Of course."

"We were not sent anywhere. We are the last of the imperial White Russian army which was defeated and thrown out of Moscow five months ago. The new government, I believe, strictly favored isolation and, I am certain, is in no position to favor anything else. There is no government now in Germany, aside from a few scattered officers in places which were not touched by our regrettable campaign of crop-destroying insects. Spheres of isolation are being formed with scorched-earth belts about them. We sought to establish ourselves in Paris, some two weeks' march from here, but there is nothing there but starvation. We sought to reach the coast in the hope that the starvation frontiers had not yet reached there."

"They have."

"For your sake I regret it."

"Where shall you go now?"

"I am not sure, but I am told by stray wanderers that there may be such regions in Italy. We have been living as we could off the land, and we can continue to do so. We seem to be wholly immune to soldier's sickness and for that we are thankful. A serum was developed in Moscow last year and we have all been given it."

"I trust you find such a place in Italy," said the lieutenant, extending his hand.

"And luck to you," said the Russian. He bowed and turned on his heel, marching at the head of his staff and bodyguard down to the waiting troops in the valley below. With them went their own belongings.

The lieutenant watched from his vantage spot for some time and then, regaining his good spirits, made a tour of his brigade.

That afternoon, with the Russians gone, the lieutenant's forces tasted the fruits of victory. One and all, they gorged themselves upon dripping roasts of horseflesh, cooked by a prideful Bulger.

III.

FOR EIGHT DAYS the Fourth Brigade lived off the Russians. It was not luxurious, but it was better than crumbs scraped out of a fortress twenty years in its grave. Apparently the Russians had met and defeated other forces to the east, for the stores included a kind of bread, made of bark and wild wheat, peculiar to Rumanian troops and a wine which Alsatian soldiers concocted from certain roots. Too, there were some spare tunics and overcoats, evidently located in some hitherto-forgotten dump. These, though slightly moldy and insect-frayed, were most welcome, espe-

cially since they were light tan, a color which blended well with the autumn which was upon them.

But at the end of eight days the brigade began to show signs of restlessness. Wild geese, in increasing flocks, had begun to wing southward, and the men lay on their backs, staring moodily into the blue, idly counting.

The lieutenant paced along a broken slab of concrete which had once been part of a pillbox commanding the valley. For, with the new guns and even the scarce ammunition, the troops did not need to fear sunlight.

In his cars, too, sounded the honking which heralded an early winter. And the caterpillars which inched along and tumbled off the guns had narrow tan ruffs which clearly stated that the winter would be a hard one. Spiders, too, confirmed it.

It was one of those infrequent times when the lieutenant did not smile, which heightened the effect of his seriousness. Men moved quietly

when they came near and did not linger but cat-footed away. The battery crew silently sat along the grass-niched wall and studiously regarded their boots, only glancing up when the lieutenant went the other way.

All hoped they knew what he was thinking. The winter past had not been a comfortable one: starving, they had huddled in an all-but-roofless church, parsimoniously munching upon the stores they had found buried there—stores which had not lasted through. At that time the Germans were still making sporadic raids, not yet convinced that their own democracy could win out against the French king, but bent more upon food than glory. The brigade had marched into that town four hundred and twelve strong.

And now winter was here again, knocking with bony fingers upon their consciousness. Longingly they looked south and watched to see if the lieutenant gave any more heed to one direction than another.

Not for their lives would they have bothered him. Even Mawkey stayed afar. And it came to them with an unholy shock when they saw that a man had been passed through the sentries and was approaching the lieutenant with every evidence of accosting him. Several snatched at the fellow, but, imperiously, he swept on.

He might have been a ludicrous figure at a less tense moment. He was a powerful brute, his massive, hairy head set close down upon his oxlike shoulders. But about him he clutched some kind of cloak which would have heeled an ordinary being but only came to his thighs. On his head he had a cocked hat decorated with a plume. At his side swung a sword. On his chest was a gaudy ribbon fully two feet long.

Without ceremony he planted



himself squarely before the lieutenant and lifted off his hat in a sweeping, grandiloquent bow.

THE LIEUTENANT was so astonished that he did not immediately return the salutation. Carefully he looked the fellow up and down, from heavy boots back again to the now-replaced cocked hat.

"General," began the intruder, "I come to pay my respects."

"I am no general, and if you wish to see me, get permission from my sergeant major. Pollard! Who let this by?"

"A moment," said the hairy one. "I have a proposition to offer you, one which will mean food and employment."

"You are very sure of yourself, fellow. Are we mercenaries that we can be bought?"

"Food is a matter of need, general. Allow me to introduce myself. I am Duke LeCroisaut."

"Duke? May I ask of what?"

"Of a town, general. I received the grant from the king not three years ago."

"King?"

"The King of France, His Majesty Renard the First. My credentials." And he took forth a scroll from his cloak and unwound it.

Without touching it, the lieutenant read the flowing phrases in the flourishing hand.

"Renard the First has been executed these last six months. And I, fellow, have nothing to do with the politics of France. We waste time, I think."

"General, do not judge so abruptly. My town, St. Hubert, has come into the hands of a brigand named Despard, a former private in the French army, who has seen fit to settle himself upon my people, oppressing them."

"This is nothing to me. Guard, escort this man beyond the sentries."

"But the food—" said the duke with a leer.

The lieutenant shook his head at the guard, staying them for a moment. "What about this food?"

"The peasants have some. If you do as I ask, it shall be yours."

"Where is this town?"

"About a week's march south and west for you and your men; two days' march for myself."

"You evidently had *some* troops. What happened to them?"

"Perhaps unwisely, general, I dispensed with their services some months ago."

"Then you wish us to take a town, set you up and— Here! What's this?"

The fellow had sunk back against the concrete wall. He had been breathing with difficulty and his hand now sought his throat. His eyes began to protrude and some flecks of blood rose to his lips. He shook.

"An old wound—" he gasped. "Gas—"

The lieutenant unlimbered his pistol and slid off the catches.

"No! No, no!" screamed the duke. "It is not soldier's sickness, I swear it! No! For the love of God, of your king—"

Smoke leaped from the lieutenant's hand and the roar of the shot rolled around the valley below. The empty tinkled on the stones. The lieutenant stepped away from the jerking body and made a sweeping motion with his arm.

"March in an hour. I do not have to caution you to stay away from this body. Mawkey, pack my things."

"The guns?" said Gian, worriedly glancing at his pets and then be-

seechingly at the lieutenant.

"Detail men to haul them. They're light enough. But leave the three-inch. It would bog before the day was out."

"Si," said Gian gladly.

Shortly, Sergeant Hanley hurried up. "Third Regiment ready, sir."

An old man named Chipper piped, "First Regiment ready, sir."

Tou-tou bounded back and forth, making a final check from the muster roll he carried in his head. Then he snapped about and cried, "Second Regiment ready, sir."

Gian, overcome by new importance, saluted. "First Artillery ready, sir."

But it did not come off so well. The Fourth Brigade's First Artillery, a unit of .65-caliber field pieces, had been drowned to a man in a rising flood of the Somme while they strove to free their guns. For an instant the people here glanced around and knew how small they were, how many were dead and all that had gone before; they felt the chill in the wind which blew down from countless miles of graveyard.

"Weasel!" bawled the lieutenant. "Lead off at a thousand yards with your scouts. Bonchamp! Bring up the rear and shoot all stragglers. Chipper and Herrero, wide out on the flanks! Fourth Brigade! *Forward!*"

The wind mourned along the deserted ridge, searching out something to twitch. But nearly all signs of the camp had been destroyed, just as there would be left no mark along the line of march by which another force could follow and attack. The wind had to content itself with the cloak of the dead man which it lifted off the legs time and again, and the gaudy ribbon which it rippled over the cooling face.

MALCOLM matched the lieutenant's stride, glancing now and then at the man's quiet profile. Malcolm could not rid himself of the vision of the duke trying to stop a bullet with his hands and screaming his pleas for life.

"Lieutenant," he said cautiously and respectfully, "if . . . if one of your men came down with soldier's sickness . . . would you shoot him like that?" Malcolm clearly meant himself.

The lieutenant did not glance at him. A shadow of distaste dropped over him and passed. "It has happened."

Malcolm avoided the finality of that statement. "But how would you know? How *do* you know that that fellow back there had it? Wouldn't gas—"

"Yes. It would."

"Then . . . then—"

"You've seen men die of soldier's sickness."

"Of course."

"You were in England when the first waves of it came. Over here, when one man got it, his squad got it shortly after. No one knows how it travels. Some say by lice, some by air. There was only one way to save a company and that was to execute the squad."

"But . . . but some are immune!"

"Maybe. The doctors who tried to make the tests died of it, also. Let's have an end of this, Malcolm."

They walked in silence for some time and gradually forgot about it. They had come to a broad valley matted with young trees. Here and there stone walls showed brokenly in the undergrowth; less frequently the gashed sides of a house stared forlornly with its gaping windows. Pounded into the earth by rain of a dozen years lay an ancient tank, its gun silently covering the clouds

which scurried south.

The men were not in any recognizable formation of march, but there was a plan of sorts despite the appearance of straggling. Loosely they formed a circle two hundred yards in diameter, a formation which would allow both a swift withdrawal into a compact defense unit from any angle of attack and would permit a swift enveloping of any obstacle met, the foremost point merely opening out and closing around. But the movements of the men themselves were quite independent of the organization, for they marched as the pilot of an ailing plane had once flown—not from field to field, but from cover to cover. All open spaces were either traversed at top speed, completely skirted, or else crawled through. The equidistant posts were very flexible of position according to the greatest danger of the terrain; these, too, were loose circles save for the rear guard, which was a long line, the better to pick up any willful stragglers or extricate any which had been trapped in the pits with which all this land abounded—pits which had the appearance of solid ground, built to impede troops and used now by peasants who found a need for clothing and equipment.

The one officer, if such he could be called, who had latitude of movement for his small group was Bulger. Bayonet thrust naked and ready in his belt, helmet pulled threateningly down over one eye, filthy warm flapping against his heels, he roved purposefully and thoroughly, rumbling from flank to flank and beyond, appearing magically inside and outside the circle of march. He would overrun the vanguard, inspect the ground ahead and then go rambling off with two or three scarecrows at his heels to poke into some suspicioned rise

of ground and, sometimes, send a runner back to change the whole route of march to roll over the place and pick up cached supplies. After a good day Bulger would begin the evening meal by pulling birds, onions, old cans of beef from an unheard-of time, moldy loaves and wild potatoes from that warm which seemed to have the capacity of a full transport; for while the main discoveries had been shared around, Bulger took a joy in personal collection which outrivaled, if possible, his lieutenant's love of victory without casualty! These choice bits—and scarce enough they were—made up, first, the lieutenant's board and, second, the noncoms' fare. The brigade said of Bulger that he could hear a potato growing at the distance of four kilometers and could smell a can of beef at five.

THE BRIGADE flitted swiftly over an exposed chain of embankments which had been a railroad, long ago shelled out of existence and then robbed of its rails for bomb-proof beams. Bulger alone paused at the top, his hairy nostrils quivering avidly. He broke his trance and sped forward, presently lumbering past the vanguard. Weasel's narrow face popped alertly from beyond a bush.

"I don't hear anything," complained Weasel.

Bulger touched his nose pridefully and swept on, vanishing into the undergrowth ahead. As this was the mid portion of the valley, the only difference of level was a stream. This was revengefully eating away at an old mill dam, having already toppled the shell-burst mill down the bank. But there was no ocular evidence whatever of anything unusual.

Telepathically quiet, the word

skinned through the brigade and the route of march shifted. Gian's artillery, which had been annoying its motive power by forbidding their taking the best cover, was balked by the stream until Gian, scurrying up and down the bank, found a shallow bar which had been built up by the downfall of an old bridge.

Bulger and his two scarecrows flickered beyond a screen of willows and vanished afield; one of the men, as runner, reappeared as a signpost and was scooped up by the advancing Weasel.

Presently the first sign of habitation was noted by the lieutenant. A rabbit snare flicked at his foot and sprang free. A moment later he brushed through a camouflage of small shrubs and was abruptly confronted by a plowed field. A crude arrangement consisting of a harness and a twisted stick had been turned back the furrows. A woman's cap lay on the untouched ground, but there was no other sign than this and tracks of those who had been there but a moment before.

Like a bear on the scent of a honey tree, Bulger was plunging along the fringe of wood, searching for a path and failing wholly to find it. The lieutenant, accompanied by Mawkey, came from cover and joined him.

"I smelled fresh earth," said Bulger, "and here it is. But where the seven devils is the trail?"

"There," said Mawkey, slightly disdainful. The tunnel looked as if it would refuse to admit anyone larger than a rat terrier, but Mawkey's eyes had seen a broken twig and so had been directed to this covered hole in the undergrowth.

"If they got energy enough to plow, they must have something to eat," reasoned Bulger with his usual single-mindedness. And immedi-

ately stooped to paw away the screen.

The lieutenant brought him back by a yank at his boot and, despite Bulger's size, landed him some ten feet from the hole. There was a sharp explosion and a crater appeared where the tunnel had been.

Bulger got to his knees looking sheepish.

"I'll be changing your diapers next," said the lieutenant to the assembled. "Falling for a planted grenade!" He faced about and signaled Weasel up with the vanguard. "Drop back with your kettles, Bulger, and be careful you don't drop one on your toe and kill yourself."

"Wait!" cried Bulger. "Please, sir. Wait! The wind's changed. I smell wood smoke!"

Weasel tested the air, mouth half open, walking around in a small circle and looking skyward.

"There!" cried Bulger. "It's stronger now! Real dry wood burning." And, having redeemed himself, he rumbled after the scent, the slight Weasel trotting at his heels.

The lieutenant circled his right hand over his head, left hand extended palm down for caution. A few leaves stirred around the borders of the field. The brigade was moving up.

Presently one of Weasel's men bobbed out before the lieutenant. "Over to the right, sir."

The lieutenant swung in that direction and found Weasel and his vanguard standing around a pit, pulling up one of their number. The lieutenant gave a searching glance to the immediate surroundings and stepped forward. The trapped man's leg was bleeding where the stake at the bottom had gouged him. It was not serious and Mawkey laid the fellow out and bandaged it, hav-

ing placed a chunk of spongy pitch in the wound.

There were some bones in the excavation, but no sign of any equipment. Alertly the lieutenant paced back and forth over the ground. In a moment he thrust a stick into a solid-appearing patch and so knocked the camouflage through. There were bones here as well.

"Pass the word," he said to a runner.

Bulger trundled his excited bulk back to them. "Sir, I've found it. About eighty houses and a dozen storerooms."

"Lead off."

THE LIEUTENANT strode along at Bulger's heels, knocking in an occasional pit and warily avoiding the invitation of clear walkways, going through brush instead. The wood smoke was apparent to him now, though elusive.

They came to a flat expanse which was even more brush-covered than the surrounding terrain. There was nothing whatever to remark the presence of people and, had they come by earlier instead of at the time of the evening meal, it is certain they would have missed the village altogether.

The barest suggestion of heat waved in the air above the place. Only one wisp of smoke could be seen in the evening air, and the source of that could not immediately be traced. The lieutenant, from cover, examined the place minutely and it gradually began to take definite form for him.

He waited for some time, knowing that the brigade would envelop the place, and then turned to Mawkey: "I am going forward. Pick out and mark all the smoke spots and watch for my signal."

He pulled down his visor and drew

his pistol. Then, wrapping his cloak tightly across his chest, walked into the open! Instantly several shots snapped at him, two of them striking him and, for an instant, breaking his pace. Dark had been settling slowly for some little time, but the first indication he had of it was his ability to see the flashes from the rifles, which were orange in the half-light. Again shots drilled savagely around him. They came from the center in their highest concentration.

"Hello, the leader!" shouted the lieutenant in French.

The firing ceased and from nowhere in-particular a voice rose from the flat earth. "We have no wish to see anyone! Go or we shall use grenades!"

"You are surrounded by the Fourth Brigade. We have artillery!"

There was a long pause and then, falsely aggressive, the same voice cried: "Devil take your artillery! We have much to answer!"

A grenade bounded from nowhere to the lieutenant's feet. It exploded with a bright flash.

The lieutenant lifted himself from the depression some five yards beyond the place where it had gone off.

"One more chance. Surrender peaceably or take the consequences."

"Go to the devil!"

The lieutenant vanished into another patch of cover which was instantly raked by fire. He whistled shrilly twice. Instantly the villagers opened up on the borders of their field. But no shots came in return. Dusk was dropping swiftly now and it was that period of the day when it is both too dark and too light to see moving men.

The fire from the hidden emplacements slackened and stopped. Mystified and none too sure, the villagers conserved their scanty cartridges.

Short calls began to sound throughout the clearing, and the lieutenant waited until they had done. There was silence then for several minutes.

"We still offer you your chance to give over," stated the lieutenant. "All we require is billeting and food."

"We haven't changed our minds," said the leader.

"I shall count to ten. If you have not by that time, I cannot answer for the consequences." And he counted, very slowly, to ten. And there was no reply.

THESE PEOPLE were tougher than the lieutenant had suspected. Usually his own careless appearance and the reports were sufficient to shake resolve. He shrugged to himself. Little he cared.

He gave a short whistle in a certain key and there was a faint wave of movement through the clearing. Then, after a short time, the smoke began to clear from the air. Presently there sounded some coughs under the earth. And then more. The smoke which had vanished now began to thicken in the night. Throughout the village, handfuls of green leaves had been thrust down the camouflaged chimneys.

The coughing increased as the smoke increased, and there came wails of despair, the rattle of poles which sought to clear the obstructions, and the frenzied swearing of men trying to haul the green leaves from the grates.

The lieutenant lay upon his back and looked at the evening star, jewel-like in the darkening heavens. Other stars came slowly forth to make up constellations. A breeze played with the treetops and made them bow before the majesty of night.

"My general!" sobbed the leader. "We have seen the error of our de-

cision. What mercy can we expect if we come up now?"

The lieutenant counted the stars in Cephus and began upon the Little Bear.

"My general! For the love of Heaven, have mercy! There are children here! They are strangling! What can we expect if we come up now?"

With a sigh, the lieutenant gave his attention to the Great Bear and tried to make out the Swan, part of which was hidden by the drifting smoke.

There was a ripping of brush and the thump of a door thrown back and the clearing was immediately alight and fogged with billowing smoke. The lieutenant stood up. Soldiers materialized from the earth and people were herded into weeping, pleading groups. A few madmen gripped rifles, but were so obviously blinded that no one wasted ammunition upon them but merely wrenched the weapons away and pushed them into the crowds.

"Clear the chimneys," said the lieutenant. "Anyone who happens to have a mask, go below and clear the grates."

"I would never have surrendered," said the leader, groping toward the voice of command. "But they were going out down there! For the love of Heaven, don't kill us! We are friendly. Truly we are friendly. We shall show you the storehouses, give you beds, women, anything, but don't kill us!"

The lieutenant turned away from him in disgust and watched his men dropping down steps into the earth.

"We have so little but we give it all!" cried the leader, pulling at the hem of the lieutenant's cape. "But spare us!"

"Pollard," said the lieutenant,

making a slight motion with his hand. The leader was dragged away.

Presently Sergeants Chipper and Hanley drew up before their commander. "I guess you can breathe down there now, sir," said Hanley. "At least, on my side."

"This half all cleared, sir," said the veteran Chipper, indignant at this fancied gibe about his age.

"Pollard! Billet the men as the huts will take them. Be certain to collect all weapons and mount a guard upon them. Post sentries at fifty-yard intervals along the edge of the village."

"Yessir!" said Pollard.

Gian came up, sour because he had had no chance to use his artillery. "Smoke," he muttered, disgustedly.

"Gian," said the lieutenant as though he had not overheard, "take a post to the north there on that little rise and hide your guns well. From there you can rake anything which puts in an appearance—with the exception, of course, of British troops. We'll depend upon you to give us a sound night's sleep."

Gian brightened and got two inches taller. "Anything, sir?"

"At your discretion."

"Yessssss, ssssssir!"

"Mawkey! Locate the leader's house and ask Tou-tou to please post a sentry over it."

Bulger dashed by, rubbing his hands together and swearing with delight as he uncovered storehouse after storehouse.

"Come along, Malcolm," said the lieutenant, presently.

THEY FOLLOWED Mawkey down into the earth and found themselves in a large but low-ceilinged cavern. The roof was arched, supported by crudely hewn logs and railroad rails

and smoothed off with a coating of dried white clay. The floor was carpeted with woven willows. Old fortress bunks were ranged along one wall and covered with army blankets. The furniture was all of branches, lashed with a kind of vine, with the exception of the table, which was topped by an old tank plate and supported artistically with upended one-pounders. The fireplace was of metal plate built into mud and stone and was fitted with several ingenious hinged shelves at variant heights above the grate. Evidently a fireplace was used because it smoked less than a stove. The utensils which hung about were all military, bearing various army stamps. Old gas curtains were so arranged as to divide the place into sections, but they had strayed so far from their original purpose that they lacked two feet of reaching the roof.

Two other entrances led off, one near the bunks and another at the side of the outside door. Several pedestals were in place along the walls below roof cavities just big enough for a man's head; outside these were armored-car turrets projecting slightly into clumps of brush. The weapons had already been collected, but their racks occupied a prominent place. A series of channels edged the bottoms of the walls, made of bright airplane alloy, to catch any water which might come in from above.

The hut was more colorful than could be expected, for camouflage paint brightened the supporting columns and the bunks and table and several bunches of flowers were about, placed in vases hammered out of large shells.

The place was lit by an intricate system of polished metal plates which, in the daytime, brought the light down from the slots and, at

night, scattered around the light from the fireplace.

The lieutenant grinned happily and stood up to the blaze to warm his hands. The sentry stepped into place at the bottom of the stairway and Mawkey closed and bolted the passageway doors.

Carstone looked in. "Any orders, sir?"

"Might post a couple of guns at the corner of the clearing to rake it in case."

"Yessir." He lingered for a moment.

"Yes?"



They marched silently through the dripping ruins of the long-deserted fortifications. Skeletons slumbered in their bunks, rusted and broken big guns slumped over them.

"I found another pneumatic tank, sir. They use it for water storage."

"Take it along."

"Thank you, sir."

"Ah," sighed the lieutenant happily, getting the weight of his cape from his shoulders. He unstrapped his helmet and gave it over to Mawkey.

"Near thing, sir," said Mawkey, poking a finger into the cape where a new slug had gone in exactly upon an old one.

"Mawkey, isn't there any way to get the bullets out of that thing? It weighs nine hundred pounds more every night I remove it."

"I saw some parachute silk on one of them women, sir. I could cut out the bullets and wad that stuff for a patch. It'd be safer, sir."

"By all means, Mawkey."

"Sir," said the sentry, "there's a bunch of people up here that want to see you."

The lieutenant made a motion with his hand and the sentry beckoned to someone up in the darkness. In a moment a woman, followed by two small children, came down. She looked as bravely as she could at the officers and then instinctively chose the lieutenant.

"You are our guest, sir," she said in halting English.

"Oh, yes, of course. You live here, eh? Well, there's plenty of room. By all means, bring your family down."

She looked relieved and made a beckoning motion to the top of the stairs. Three younger women and another child came down, followed by a very hesitant young man who stood defensively between two who were apparently his wives. A fifth woman came, helping a very aged

dame whose eyes gleamed curiously as they inspected the officers. She, too, turned her attention to the lieutenant.

"You good gentlemen gave us a time," said the old woman in French.

"Hush," said one of the women, terrified at such boldness.

"Well, if they didn't kill us before, they aren't going to kill us now. Welcome, gentlemen. In payment for our lives these girls will get you a very good supper."

The five younger ones made haste to tuck the children into the far bunks, where they lay with their heads submerged and only their wide eyes showing. An attractive blonde hurried to the fire to replenish it and, so doing, dropped a stick of wood on the lieutenant's boot. She backed up, paralyzed.

"Don't mind Greta," said the old dame, sitting down and putting her toothless chin upon her cane. "She's a Belgian. Pierre here brought her back one day. You can't really blame a Belgian."

"Of course not," said the lieutenant. He looked curiously at the girl and smiled. Very cautiously she retrieved the piece of wood and cast it on the fire without again daring to look at him.

The young man had settled himself watchfully in the corner. His hands were enormous with toil; his eyes were brutish and sunken. He suggested an animal in the way his shoulders hunched. The girl Greta, sent for food from the locker at his side, walked clear of him, but he succeeded in seizing her wrist.

"You clumsy fool," he whispered harshly. "Do you want us all killed? I would not be surprised if you did that on purpose."

She wrenched away from him, her whole body suddenly like a flame.

She struck him across the mouth and then yanked open the locker door in such a way that it pinned him in the corner while she got the mask container of flour.

The old woman was delighted at the young man's discomfiture. "Well! I have been wondering how she would answer you at last."

"Serves him right," whispered one of the women to another. "Picking up strays."

Their laughter stretched his intelligence beyond its elasticity and it snapped into rage. As soon as he was released he lunged at her and began to strike at her, roaring that she had pushed him away too long. But he stopped with a scream of pain and dropped to the floor, holding the side of his head. At a sign from the lieutenant, Mawkey had thrown his chains.

"I'll have no fighting here," said the lieutenant. "Throw him out."

The sentry's fingers fastened about the clod's collar and he was wrenched toward the door.

"Don't have him killed!" screamed the young man's wives, instantly down and clutching at the lieutenant's boots. One of the children began to howl in fright.

With distaste the lieutenant freed himself. Malcolm was grinning at the predicament. Greta stood with her straight back pressed hard against the wall, watching the lieutenant.

Pollard was down the steps in an instant with drawn automatic, knocking the young man out of the sentry's grip and down to the floor once more. The clod, snarling, rebounded. The room was full of flame and smoke and sound. The clod was down on his hands and knees, shaking his head like a groggy bull. He tried to reach Pollard and then, ab-

ruptly, the effort went out of him and he dropped to the mats, kicking straight out with his legs with lessening force. Pollard rolled him over with his toe. The arms flopped out and the blood-spattered remains of a face stonily regarded the beams above.

The two women who had protested started forward and then checked themselves, their eyes fixed upon the body. Slowly, then, they turned and went back to the bunks to quiet the wailing of the young one.

"Everything else all right?" said Pollard, smoothing his rumpled tunic.

"Carry on, sergeant," said the lieutenant, making a small upward motion with his hand.

Mawkey and the sentry towed the corpse up the steps. One of the women took a handful of reeds and hot water and cleansed the mat. Malcolm was gray.

The lieutenant warmed his hands before the blaze and the affair drifted out of his mind. Greta, eyes lowered, began to mix panakes.

THE BUSINESS of supper went on and soon the lieutenant and Malcolm were eating at the table while Mawkey squatted over a pannikin in the corner. The sentry's back was expressive, moving restively and then springing erect in gladness as his fed relief came down to take over. The women sat at a smaller table by the fire with the exception of Greta, who waited with swift, quiet motions upon the officers and seemed to have forgotten about food. Angrily, at last, the old woman called to her and made her sit against the wall with her dinner.

"You are going far?" said the old woman.

"Far enough," said the lieutenant, smiling.

"You . . . you intend to carry away our stores?"

"We won't encumber ourselves with them, madame. An army fights badly upon a full stomach, contrary to an old belief."

She sighed her relief. "Then we will be able to live through the winter."

"Not unless you find some other way of disposing of your smoke," grinned the lieutenant.

"Ah, yes, that is true. But one does not always find an attack led by an officer."

"But, on the other hand, one sometimes does." The lieutenant stretched out his legs and leaned back comfortably, opening up his tunic collar and laying his pistol belt on the table with the flap open and the hilt toward him.

The old woman was about to speak again when the sentry snapped a challenge and then rolled aside on the steps to let Pollard come down.

Pollard, a fiend for duty, stood up censoriously, his long mustache sticking straight out.

"Well?" said the lieutenant.

"Sir, I have been checking Bulger's count on the storehouses. And—"

"Why count them? We're heading away from here at dawn."

Pollard received this without a blink. "I wanted to report, sir, that we have uncovered thirty-one soldiers."

"Feed them, shoot them or enlist them," said the lieutenant, "but let me digest a good dinner in peace."

"Sir, these men were naked in an underground cell. Fourteen of them are English. They have been used as plowhorses, sir. They say they were trapped and made slaves of,

sir. One of them is balmy and I'm not sure of a couple more. They been cut up pretty bad with whips. Another says they're all that's left of the Sixty-third Lanciers."

"Dixon! That's Dixon's regiment!" said Malcolm.

The lieutenant sat forward, interested. "Jolly Bill Dixon?"

"That's him," said Malcolm.

"They say he's dead, sir."

"By Heaven—" began Malcolm, starting up.

The lieutenant motioned him back into his chair. "Bring the leader of this village down here, Pollard."

"Yessir."

The old woman was thumping her cane nervously, her eyes fever-bright. "General—"

"Quiet," said Mawkey.

THE ROOM fell very still with only an occasional pop of the fire and the movement of shadows to give it life. The flame painted half the lieutenant's face, which was all the worse for having no particular expression beyond that of a man who has just enjoyed a full meal.

The leader was thrust down the steps in the hands of two guards. His small eyes were wild and blood-shot and he shook until no part of him was still. His sudden fright passed and he managed to fix his gaze on the lieutenant.

"When we came in," said the lieutenant, "I saw evidences of traps. There were bones in them and no equipment."

"The soldier's sickness! I swear, general—"

"And we have just located thirty-one prisoners. Soldiers you saw fit to convert into slaves."

"We have so much plowing, so few men—"

"You're guilty, then. Pollard, hand him over to those soldiers you found."

"No, no! Your excellency! They have not been mistreated, I swear it! We did not kill them even though they attempted to attack us—"

"When you take him out, parade him around a little so that this offal will know enough to respect a soldier," said the lieutenant.

"Your honor—"

"Carry on, Pollard."

"But your excellency! They'll tear me to pieces! They'll gouge out my eyes—"

"Am I to blame because you failed to treat them better?"

The old woman leaned toward the lieutenant. "My general, have mercy."

"Mercy?" said the lieutenant. "There's been none of that that I can remember where peasants and soldiers are concerned."

"But force will be met with force," said the old woman. "This is a good man. Must you rob this house of both its men in one night? What will we do for a leader? There are only seven hundred of us in this village and only a hundred and fifty of those are men—"

"If he is alive by morning, let him live. You have your orders, Pollard."

"I'll give them full rights!" wailed the leader. "A share in the fields, a voice in the council—"

"You might communicate that to those fellows," said the lieutenant to Pollard. "No man is good for a soldier if he allows himself to be trapped in the first place. Carry on."

The leader was led away and the lieutenant relaxed again. Greta filled his dixie with wine and he sipped at it.

The other women in the room were very still. The children did not cry now. The fire died slowly down.

Shortly there was a commotion at the top of the steps and the sentry there reared up with his rifle crossed, barring passage to several men who seemed to desire, above all things, to dash down and worship the officer who had set them free. Finally understanding that the guard would have none of them, they went away.

"—a voice in council," the leader was saying, falsely hearty. "For some time I've kept my eye on you—Glad to have such an addition—"

The women in the room started breathing again. A child whimpered and was caressed to sleep. Wood was tossed upon the fire and the room became cheerfully light.

"You are a good man, my general," said the old woman in a husky voice.

Greta sat in the recess of the chimney seat, her lovely body perfectly still, her eyes steady upon the lieutenant.

A long time after, the lieutenant lay in the bunk farthest from the door, gazing at the dying coals upon the grate, pleasantly aware of a suspension in time. Tomorrow they would again be on the march, heading back to G. H. Q. and an uncertain finish. He was quite aware, for the first time, that the war was done. He was aware, too, with ever so little sadness, that England and his people were barred to him, had rejected him, perhaps forever.

One by one the glowing coals went out. He slept.

UNGUH MADE A FIRE

By Ross Rocklynne

—and an old race died in its flames . . .

Illustrated by Don Hewitt

THE ship from Mars plummeted down through the atmosphere, hovered on fiery wings above a lush valley in the temperate regions of a Middle Pliocene Earth, and then came gently to rest on a grassy plain between a quietly flowing stream and a dense forest.

Commander Talbo, his duties in the control room given over to Keddel, second in command, smiled gently through the heavy lines of his face, and made his way abaft. He staggered slightly, even under the normal Martian gravity with which the ship was provided.

He reached his objective, a large observation room fringed with fused quartz windows, and closed the door behind him, standing with his back against it, watching, for the moment, the twenty-six occupants who, besides himself, Keddel, Cay, and Rignor, were the sole survivors of a plague which had wiped Mars clean of the race it had cradled from infancy.

With their backs to him, silent as meteors winging their way through the cold of space, they were staring out at the lush world that was to be their abode—at the silvery river, the tall waving grass, the giant plants that reared themselves splendidly into the sighing air, at the setting Sun, so much brighter and larger than they had ever seen it.

He had made no sound, but Teth

turned to him, her eyes shining and happy, but concerned now as she noticed the weariness widespread on her father's face.

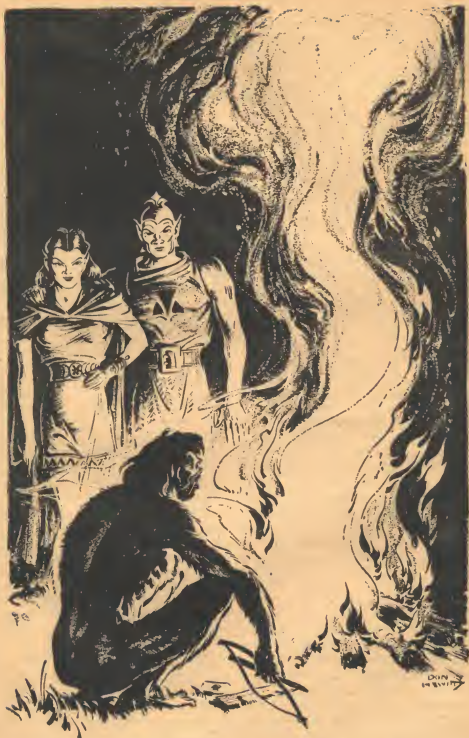
"You are tired," she said softly. "You are going to sleep."

"I will when I have spoken to the others," Talbo promised.

Those looking through the windows had now turned, and were facing their commander. None was over fifteen Martian years of age, and all were filled with the buoyancy and hope of youth, for Earth seemed truly beckoning to them with pleasant promises. A reddish-yellow they were in complexion, with small lips, large nostrils, double-lidded eyes, pointed ears, and seven-toed feet, and seven-fingered hands; their chests were huge, and the breadth of their shoulders such that at the hips they might have seemed attenuated had this not been their standard of beauty. They were dressed simply, in cloths, and metal braid kilts and sandals of all colorful shades. They waited respectfully for their leader to speak.

"I must thank you first for your co-operation," Talbo said slowly and tiredly. "There were times on the trip when every moment was sheer monotony. You have my thanks, both for your unending patience and your optimism.

"But what I want to say, what I must say, is with regard to the



Unguh sat and stared at the thing he had made with an almost holy awe—

plague—to *obshor*. There is the possibility that, by one moment's hesitation, the race which lived so gloriously on Mars shall die altogether.

"One of us may be the plague's carrier. One of us may, at any moment, see evidence of the maturing germs upon him. It is a painful subject, but that one knows what he must do. There is—The Room."

His audience shifted uneasily, and Talbo smiled gravely.

"But on the side of optimism, I may tell you that, in essence, this world is ours to do with as we please. Earth is ours to build upon. It is empty of intelligent life, but it abounds with animal life and vegetable, and we shall not want for food. And for shelter? I have an idea about those giant plants out there, which, I assure you, are merely amazing because we have nothing—had nothing—like them on Mars. We shall live in this warm valley, and live gloriously, and the plain which stretches away about us to the mountains shall, at some not far distant day, contain the beginnings of a civilization which will in time transcend even that to which we attained on Mars."

He concluded with a smile, and Teth took his arm. Talbo had worked hard for the past thirty hours, and the mental strain of guiding the ship through the meteoric barrier that seemed to surround Earth had left him unnerved.

She took him to his room, helped him off with the more difficult items of his clothing, and then stood tenderly over him as he crept between silken coverlets.

Talbo eyed her gravely now, though his lids were heavy. "I am afraid the burden lies chiefly on you, Teth," he murmured. "To give rebirth to a race!"

"I shall not mind," she said softly. "But Cay must be my first husband."

"He shall." Talbo's eyes closed, and soon his breathing became deep and steady. Teth left noiselessly.

SWIFTLY Teth ran down the corridor, her broad chest, long limbs, narrow hips projected in distorted shadow form by cold-light bulbs.

She descended a spiraling ramp, pushed on a door which led into the engine room. She stood with her back against the door, her red eyes sparkling with flame, as she observed the tall Martian Cay bending over his controls on the air machine; the air pressure within the ship was being gradually increased, until, by the morrow, it would conform with that of Earth.

Teth ran up behind Cay, clasped him fiercely. He swung around, pressed a caress to her lips.

"My laughing Teth!" he murmured. "And laughing more than ever before."

"I'm happy!" she exclaimed. "We've landed, and we've got a whole world all to ourselves. It's a young world, rich in air, rich in water, and rich in beauty." She paused, tensed, and sighed. "But sometimes I am sad! There will not be much to my life, Cay. I'll have you for one short year, bear a child—and then I must take another husband. Why couldn't more girls have been with us when the news came? But then, what if even I had not been there?" She shuddered.

"We must put the continuation of the race above ourselves," said Cay. "I'm glad there is a chance for the race to grow again. It *will* grow if . . . if *obshor*, if the plague does not take us."

She tensed again, and a look,

almost of intense pain, crossed her soft features. She placed a long finger across his lips.

She said intensely, "Some day our cities will dot this planet, and broad highways will connect them, and great airliners will float swiftly between them, and there will be millions and millions of happy, contented people!"

"All of which," Cay agreed softly, "will be of your blood. You have a right to be proud of that future race."

THE THIRTY stepped from their ship in the morning, at first cautiously, then easily, breathing of the denser air. Happily, in groups, they began to explore the valley, the first frontier in this, their new world. Together Talbo, Cay and Teth walked the several hundred yards to the edge of the plain which died where the thick, mighty forest began. These trees were the "giant plants" to which Talbo had referred. With a sharp knife he peeled away a section of the bark, and with wonder examined the hard, fibrous substance thus revealed.

"I thought perhaps we would have to continue living in the ship," he said. "At least, until we could find an ore deposit, and build the proper kind of dwelling. But I think that we can build a house of this substance. We'll have to build some kind of instrument to cut it down and to cut it up into strips. It should not be difficult."

"It will cave in," said Teth doubtfully.

Talbo smiled. "No, Teth. You think that merely because you are used to your strong metal cities. We will not build high. We'll make a long house, and support it at frequent intervals with strips of this substance. A little experimentation

will teach us much."

Teth nodded doubtfully. "At least," she said, "it manages to support its own great weight." The three of them then stood back and followed the height of the plant clear up to its thinning top.

It was then they had seen the face, framed with leaves; with low, sloping forehead; prognathous, hairy jaw; and tiny beady eyes which was practically all that could be seen through the mat of tangled, filthy hair that fell from its low-browed head.

The face disappeared, leaving a stirring of branches in its wake. And though they stood there long, calling and making friendly overtures, it did not return. After a while, they turned back to the ship, frowning.

"I was wrong," said Talbo, a vaguely uneasy look on his face.

Cay and Teth looked at him questioningly.

"I said there was no intelligence on this planet," Talbo said. "I was wrong. There was intelligence in that face. Dim, unsubstantial, but there, nonetheless. Had we not come, it would have been that tree-man's descendants who would rule this planet. Had we not come!" he repeated. And a shadow seemed to hover over the three of them, as they quickened their pace toward the ship.

ON THE BANKS of the narrow, clear-water stream the long house took form. Weeks passed before it was built. Talbo had discovered that the sharpest knife of the most gigantic proportions would somehow not easily perform the task of felling one of these giant plants. But one man discovered the trick of notching the blade at intervals. A swift development of this inven-

tion resulted in the forging of an instrument which did the work with comparative ease. The giant plant fell, and from there it was only a step to cut it up into strips of planned lengths, to fit them together, to build a long house. It was divided up into forty individual rooms, thirty of which were used for human occupancy—for there were thirty Martians—others of which were used for storage, for gaming rooms, for eating; and one of which was—The Room, midway between all the others.

The Room, painted on its interior with a substance through which even the deadly, spiraling germs of *obshor* could not penetrate.

For, overhanging them like the sword of the not-yet-born Democles, was the dread that at any moment the plague might spring into being amongst them. There were periodic drills. Each of them knew what he must do.

Thus the first, solid basis for the new civilization was laid. Hope ran high; somehow they managed, for the time, to forget the dread of *obshor*, which had with such devastating swiftness spread itself across the face of Mars. Three Earth weeks had passed now, and surely, by this time, *obshor* would have manifested itself.

But at the end of those three weeks, the owner of the face again showed himself. Cay and Teth, clad in tough, silken garments, their duties done for the day, had gone strolling in the vast "yard" that stretched to the forest. There they had thrown themselves to the soft grass, contented, talking briefly.

Cay, his arms about Teth, suddenly stiffened. He lay a restraining hand on Teth's arm, and allowed her to turn and follow his line of

vision. There was the owner of the face, well within view between two trees a short distance away.

The body was hairy in most places, and completely nude. The arms, heavily muscled, dangled to just below the knees. The legs were slightly bowed, but long. The forest man stared at them for a long moment, and then, without warning, started shambling toward them, the look of the curious evident on his dimly intelligent features.

Cay made a movement. "We'd better get back."

"What for?" Teth said fiercely. "You're afraid for me. You shouldn't. That fellow is just curious. Let's make friends."

Cay assented, and they lay perfectly motionless. It came on, stopped, started, finally stood over them, staring, its filth-encrusted face raptly puzzled.

Cay and Teth gave stare for stare.

A single sound issued from the tangle of beard around its lips: "Unguh!"

"Now, what does that mean?" whispered Cay. "I'll just say it back to him. Unguh!"

"Unguh!" tried Teth in the way of experiment.

The forest man shook his head, cocking it sideways.

He repeated his expression and pointed imperatively at the long house.

"He's not afraid of us," whispered Teth. "Let's take him back."

They arose slowly. They started walking toward the long house, and the forest man followed with a queer wabbling gait.

"I never saw anything so wild-looking," laughed Teth. "But he looks as if he might be intelligent."

"Well, that 'unguh' most certainly means something, and he must be

away from his own country, else his whole tribe would be here."

AT THE long house, the other Martians came forth to meet them, and stood looking at the strange creature curiously.

"This is the owner of the face we saw?" asked Talbo.

"I suppose it is," smiled Cay. "Anyway, I've decided to name him Unguh. That's what he's been shouting at us ever since we met."

Unguh looked stupidly on; no mirthful grin contorted his dirty face.

"Unguh!" he finally repeated.

"His favorite conversational topic," said Keddel, his wistful eyes smiling.

Thinking, after some debate, that the word must mean "food," Unguh was presented the leg of a freshly killed antelope. He seized upon it, sank great yellow fangs into the succulent flesh. He squatted on his haunches, buried his face into the venison, at times emitting animal grunts of enjoyment. Now and then the eyes, smeared bloody, emerged to stare at them frowningly.

The thirty continued to watch this bestial exhibition until Unguh sucked the marrow from the bone, and threw it away. He arose, glared at Cay.

"Unguh!" he shouted, and beat with clenched hands on his mighty chest.

"Hm-m-m!" grunted Cay. "He didn't beam food after all. Unguh!"

Unguh shook his head impatiently, grasped Cay's arm, propelled him to a spot a short distance from the long house. Here he pointed to a heap of charcoal, all that remained of a wood fire used to roast meat before the ovens in the house were completed.

"Unguh!" mumbled the forest man. "Unguh, unguh, unguh!"

Cay comprehended at last. Unguh had seen the fire from the forest, and now he wanted to know what it was, perhaps how to make it.

Cay showed him how *they* made it—by striking an ordinary sliver of tough vegetable fiber tipped with phosphorous and sulphur—an ordinary match. Before Unguh's popping eyes he made a fire. With the addition of larger pieces of wood, the fire became sizable, and Unguh stared at the leaping flames, fascinated by the warmth thrown against him. He moved closer, too close, for he leaped back, and threw himself into a crouch, and snarled at this strange animal that had bit him. Evidently, he applied severe logic to the incident, for he soon learned that within a certain distance there was no harm in it.

After a while, he tried to make fire himself, seeing no difference between the sliver of wood at his feet, and the match Cay had used.

He was compelled to use logic again. Obviously one had to have a certain kind of wood to make fire. An angry light sparkled in his eyes, and he glared fiercely at the watching throng. A torrent of words issued from the thick, apish lips.

"He wants a match, Cay."

"What would be the use? I want to give him fire, and he'll give it to his race. A match won't help, nor a thousand matches. He must be taught a method within keeping of his means."

He cudged his brain. He didn't know what the primitive fire-making method of his own race had been, but, knowing that friction would have to be its basis, he finally invented a way.

He soon had a fire of his own

going, but now he had to show Unguh. Unguh was a rather stupid forest man, it seemed to Cay. But he learned. Learned to loop the string of the bow around the upper end of a stick placed vertically in a hollow scooped in a flat piece of wood, and then work the bow rapidly back and forth. Sparks flew out, ignited dried grass, which gave fire to twigs, and those twigs to larger pieces of wood. Unguh, in making a fire, had also made history, could he have but known it.

His elation knew no bounds. He squatted beside his creation, mumbling a strange jargon of words. Even after the thirty had entered the house for the evening meal, he stayed beside it, and fed fuel into its insatiable maw.

And Cay, watching him that night as he threw himself full length before his fire, thus abandoning the squatting sleeping posture of his race, wondered with vague uneasiness to whom Earth would ultimately belong. To the race of Mars, or to Unguh's distant children, and the race of Mars not even a vaguely remembered dream?

"TOMORROW is Teth's birthday," Talbo said lowly to Keddel, as the thirty sat eating the morning meal. "Rather, it will have dawned on Mars when the Sun is not far above Earth's western horizon. She's beautiful, a fine foundation on which to build the race. But"—he paused—"I have not forgotten—*obshor*."

Keddel, he of the lined face, and graying hair, looked wistfully at Teth. "You have a premonition that all is not as it should be," he said lowly, without meeting Talbo's eyes. "As I do. I fear that *obshor* is not done with us." Then he met Talbo's eyes. His wistful eyes crinkled. "What difference,

really? If we survive, it will be at Unguh's expense, will it not?"

Talbo nodded, shook his head sharply, as if he could not relish the thought. Then he rose. "We must hunt today," he said. "Tomorrow, no matter what happens, we will have a birthday festival. After that, we will begin to build the new race in earnest."

All that day Talbo, Cay, Thuran, Rignor, and five others were gone on the hunting trip, armed only with their small, adjustable paralyzers. They returned at sunset, loaded with the fruits of the chase—an antelope, two dozen rabbitlike creatures, a hyrax, and other animals which lived in that Middle Pliocene era. Already, the long house was bedecked with ribbons, and flowers and gayly colored lanterns; fruits had been gathered, and strange vegetables which had long ago been tested for edibility. Tomorrow was Teth's birthday, and no effort would be spared to make it a success.

Night came again, and Teth sat with Cay on the veranda, and they looked at the Moon, and knew it would shine on a world a million years from now, and wondered upon whom it would shine.

"Us or Unguh?" whispered Teth.

Then came Unguh, fire bow clutched tightly in his soiled hand, a shadow among shadows. Cay and Teth rose, went down to meet him.

He coughed a strange jargon of words at them, imperatively, demandingly. They followed him to where he had erected a heap of wood, piled in most disorderly fashion.

"He wants to show how smart he is," laughed Cay.

"Well, it didn't take him long to learn. He's a smart forest man."

They threw themselves down on the grass, watched Unguh proudly exhibit his intelligence. He twirled his bow enthusiastically. Soon the first feeble sparks leaped out, set fire to tinder. The whole thing caught into flame.

Then he squatted beside them, with fascination, watching the beautiful thing he had made. All the while, he talked, and threw them glances to see if they also loved this thing of dancing flames.

Teth shrank suddenly closer to Cay. "I'm scared!" she whispered.

Cay stared, then averted his eyes. "You've felt it too," he muttered.

"We're all scared. We've got that secret dread, that all our great promises for the future will be wiped out forever. Still *obshor* hangs over us. And Unguh, there he sits, thinking what a mighty man in the land he'll be. King of his tribe! He's happy, nothing to bring about this terrible sensation of uncertainty."

Cay frowned. "Nothing? Teth, we've hardly been fair to Unguh or his race. What if the plague should be transmitted to him, to all Earth?"

Teth stiffened, relaxed. "What if it should?" she asked hopelessly. "Unguh, I suppose, will have to take his chance. But it will be a terrible thing. Unguh really is better fitted for Earth than we are." For a moment they were silent, and then Teth stirred, and faced Cay, and smiled brightly. She kissed him tenderly.

"Let's not be sad, Cay! Let's be happy. Tomorrow is my birthday!" Her lips pursed. "Remember how on Mars guests would say little ridiculous verses of birthday greeting at birthday celebrations? It's an old custom."

Cay laughed and took her hands.

"All right," he promised. "I'll make one up for you, since there aren't any professional verse makers around." He became lost in thought, and then chuckled.

"Don't tell me," cried Teth, laughing. "You have to recite it tomorrow! You promised. And now we'd better go in, Cay. We'll leave Unguh with his fire." They arose, and though Unguh threw angry recriminations at them as they departed, they did not turn back.

It was noon of the next day, and Cay splashed happily about in the little hollowed-out space which served in lieu of a bathing pool. Water, pumped from the tiny river, by atomic powered machinery, poured on to him from the hydrant above him. He hummed merrily. He had wakened this morning in a good frame of mind. *Obshor*? A formless, childish dream of horror, which, of course, could never materialize now. It had been many, many Earth months since the band had left Mars. Why, then, had not the deadly, spiraling germ made its presence known before now? The answer was simple. There was no *obshor* to be afraid of. No, Earth belonged to the Martians now, and nothing could ever stop them from growing and colonizing!

He dressed, surveyed himself in the mirror, was pleased with the result, and left his room.

He hovered near Teth's door until it opened, and she literally ran into his arms. They laughed, kissed, started down the corridor, toward the veranda, from which came the happy, laughing voices of other Martians. The long house buzzed with motion and sound, as preparations were completed. They passed The Room, gave it no thought,

went on, came to the little window at the end of the corridor, and momentarily stood looking out at the vast sweeping plain. Far in the distance, Cay saw a herd of antelope skirting the forest, madly fleeing a pack of primordial wolves, who, great jaws open, were pursuing the luckless animals. Cay raised his arm, pointed out the scene to Teth.

Her eyes followed his pointing arm, but went no farther than his wrist. Suddenly, with a barely audible cry, she shrank away from him, pushed herself into a corner. Her mouth fell open and she whispered, "Don't come near me, Cay. Go away!"

Cay began to smile, and started toward her.

She screamed, her face torn with horror. "Don't come near!" she screamed. "Go away! Go away!" She cowered.

Very slowly, the blood rushed away from Cay's heart, until he felt that he was dead and stiff and without a world. He knew he must run, and quickly: But somehow he could not believe. He could not believe that—ever—Teth would cower away from him and beg him to leave. But he must, without even looking at his wrist.

He turned slowly, vaguely willing motion to his leaden feet, and then was moving away from her, and hearing her racking sobs behind him. Then he was running, and pausing in cold horror as he saw other Martians coming down the corridor toward him.

Suddenly he shouted, a simple word, over and over. The Martians hesitated, stopped, and the word came floating back to Cay's ears as if it were an echo. "*Obshor.*"

They could not comprehend, Cay saw. He shouted madly. Then they knew. As if by magic, the

corridor was clear. Cay moved again, and gained, finally—The Room.

The outer door clicked back, closed; the inner opened, closed. Lights came on, illuminating The Room. A cold, ghastly room, windowless, cheerless, made for death, death by *obshor*.

He found himself staring at the under side of his wrists in fascination. There they were, the spirals, perfect in their symmetry as if traced with the finest pen of a master craftsman.

Even as he watched, the spirals grew, winding out from centers of infinite smallness, winding, eventually, without pain, toward the heart. This was the plague that had come from space, had wiped out Mars, in less than a day. And in less than a few hours, Cay would be dead, too.

And the others? A fit of trembling seized him! No chance. If he had not been with Teth, if those others had not been coming down the corridor—

A calm born of hopelessness grew in him, and he threw himself down on the painted floor, staring upward at the painted ceiling. So Earth had not forgotten Unguh. Unguh was her child, and these misbegotten ones should die. The thought of Unguh comforted him. He had fire now. A few hundred thousands of years would see him playing with electricity.

He waited.

THE WAITING was not long. A knock came on the door.

"It is I," a faint voice said. "Keddel."

Cay answered listlessly, and the voice came back.

"You may as well come out, Cay," it said tiredly.

Cay's shoulders drooped. He unsealed the doors, and Keddel came into him, the lines about his eyes deeper than ever. He dropped a kindly hand on Cay's shoulder.

"It's no use," he said regretfully. "We are all one with you."

Cay sank heavily against the wall. "It's my fault," he muttered.

"You couldn't win," Keddel reminded him. "Come now. There is no use having regrets. The others are all seated at table, waiting. Nothing can stop us from having our party."

Cay thought of the silly verse he had constructed. He wondered vaguely if they would laugh at it now. Of course they couldn't.

"All the doors and windows are sealed?" he asked.

Keddel's wistful eyes wrinkled. "Teth thought of it. You're right, of course. Unguh must have his chance. And Cay," he said softly, "be happy, for the others will. Teth you will find in her room. We will be expecting you."

After Keddel had left, Cay went to Teth's room. He went in, and she sprang up, and threw her arms about him. She took his arm, looked deep into his eyes with her own tremulous ones, and then they went down the corridor.

The twenty-eight were seated and waiting, their faces alight with anticipation and gaiety. Teth wondered doubtfully if the emotion were forced. It did not seem so.

Cay led her to her place at the head of the table, and as she sat, the others rose. At a signal they broke into song.

There was the word again—happiness. They were wishing her happiness, with a song that had been sung when the air of Mars had been thicker, when its shallow seas had been more widespread.

Happiness! Surely there could be no more.

Tears shone in her eyes. There was Rignor's bass, Cay's tenor. She smiled at him brightly, and suddenly she was gay, and wondering why she should be otherwise. Thus she laughed, and clapped her hands in applause.

A roar ended it, like an avalanche of bells beating against a vast drum.

They lifted goblets of wine, said solemnly, "To Teth," and sat.

Gifts poured in on her, books, works of art, necklaces, jewels, pretty pictures—all priceless, but quite without any worth. And Cay rose awkwardly, his hands behind him, and recited his silly verse, which dealt with what Unguh would say to one of his fellows should that one demand a birthday greeting, if he possibly knew the date of his birthday, and which turned out to be a guttural, unintelligible sound which Cay lamely applied to Teth.

Polite laughter, and then genuine amusement rippled up and down the table, and then Cay lay two shiny objects before Teth.

"For you," he said softly, and her eyes shining and moist she ate of the fruit, for such it was. Cay had picked them up on the hunting trip yesterday, a fruit none of them had tasted before. And now it seemed the most appropriate present Cay could give.

TETH thanked him with her eyes, and the banquet commenced. Keddel arose as they ate, saying, "Let us have some music while we dine," and suited the action to the word. And soon there flowed from the wire recording he had set in motion a song so enchanting in its nuances that Keddel had chosen it, un-

wisely, as the last song of all Martian music to fall upon a Martian ear.

They ate, and all succeeded in relishing the food as if it were not the last of which they would ever partake.

"Now," said Cay, when they had finished, and wine was once again before them, "I arise to make a toast to Teth, most beautiful of Martian girls, and not," he added, "because she is the only Martian girl!" As one, they drank.

"I have another toast to make," said Keddel gravely. "A toast wiser, more pertinent than any we could make to our present companions, or lost memories. To Unguh, to his fire, to his posterity!"

And thoughtfully, slowly, the thirty rose, and the toast was drunk, in all solemnity.

They sank back into their chairs, and at that same moment, the music that came to them reached a wild, sad pitch, a medley of pain, music that was like the inchoate grief of hundreds of souls in agony.

The strains seized upon them, set up corresponding chords in their hearts, and they became silent as the cities of Mars were silent, and as lifeless as all of Mars itself.

Talbo sighed heavily. All down the line they drooped, staring into

nothing, living* the memories the song called forth. Keddel's wistful eyes became cloudy, deeper lined, lost in the past.

Cay and Teth alone had not been caught. Cay stared at them, his face slowly whitening. Teth's eyes filled, and her lips trembled. Then that happy mien of theirs had been a pretense, to be shattered in an unguarded moment by the sweet, sad strains of an immortal melody.

The silence bore on. Cay sank back in his chair, his face hardening. Abruptly he leaped to his feet, pounded the table with the flat of his hand.

"Talbo! Keddel! Rignor, Dinal, Thuran!" he snapped. "Come!"

They stirred restlessly under the lashing, but those faces lost none of their blankness, nor did those eyes brighten. Cay dropped wearily into his chair.

"You can't blame them," he muttered. "The whole race dead." And he felt his own heart beginning to break with grief.

In a moment more the two of them would have been immersed in that tidal wave of gloom, had not a strange and wholly unexpected clamor broken in on them.

A HARSH soliloquy that shattered the still air. A shouting, vocif-



erous medley of dawn words from the lips of Unguh.

The cloudiness was lost to twenty-eight pairs of eyes; twenty-eight faces abruptly showed consciousness of the world about them, and the deathly blankness disappeared. Slowly they rose, stared bewilderedly about, walked more alertly toward the windows.

Keddel alone remained beside his chair, erect in posture, faculties once more in possession. In the moment of confusion, Teth slipped around the table, and shut off the wire recording.

Keddel turned to Cay.

"Cay," he said, with precision, "Unguh must not be allowed near the house. You understand."

Cay did understand. With sinking heart he went to his room, and extracted from his chest his paralyzer tube. He came out, slowly went to a window, where Unguh stood in full view, begging them, in his furious way, to come out and watch him make fire. Yes, Cay understood. But Unguh would not.

He placed the weapon at tenth power, trained it through the window, pressed the button. The invisible emanations sped out, impinged on Unguh. He fell back, sprawling on the lush grass. He leaped to his feet, but did not run. He hesitantly broke into his growling, shouting speech.

"Unguh!" he roared, and apparently relegated the blow to his imagination.

Reluctantly, Cay pressed the button again. Unguh went bowling backward, head over heels. When he came to his feet, he was silent, utterly surprised; but still he stood his ground.

Upon receiving the third blow,

he ran, and from a distance of a hundred yards, stopped and stared back for minute after minute. Then slowly it came to him, the revelation that he had been struck, repulsed, by those within the house.

Unguh had never been so insulted. He beat his chest impotently, for the moment too incredibly stunned to believe this thing had actually happened. Fury came with a rush. Roars of horrifying intensity came from lips still soiled with the blood and dirt of his last kill. His vilification rose to undreamed heights, a scurrilous concoction of pointed invective which had never been emulated by any of his species.

But gradually his rage seemed to cool, for his profane torrent became more spasmodic. Cay and the others in the long house thought that, with his near-animal mentality, he was already forgetting. But, in truth, Unguh could not manufacture invective wholesale, and think up plans for revenge at the same time. The less he swore, the clearer did two related thoughts attach themselves, until, at last, he squatted down, mumbling fragmentarily, and started to ply his firebow.

THE THIRTY Martians went back to their seats, sat down slowly. The wine decanters began a journey up and down the table that was unending. They forgot Unguh. Laughter bubbled to their lips, heads lolled unsteadily, talk became thick.

Cay and Teth watched with something of horror. Talbo looked on with frozen face, the wine passing him by. Keddel, beside him, touched no wine, watched with drawn features, and Cay seemed to know that he was waiting, that he held reluctant approval of this attempt to forget with drink.

Minutes of drinking, of laughter, passed, and then Cay's eyes rose heavily to the window. He stiffened, jumped to his feet, staring. Tongues of flame, red as blood, had leaped up past a pane. Others belched up beside them, licking toward the eaves. Abruptly, the tang of smoke pervaded the air.

Cay looked across at Keddel, who smiled and nodded. Frozen in his tracks, Cay waited, waited until the wine drinkers became aware of smoke and red flame. As one they abruptly arose, saw the flames, saw the smoke seeping through crevices. A breath of hot air fanned at them, and the effects of the wine were gone in a moment.

Somehow, they seemed to know this fire was not a menace. Cay, Talbo, Teth, Keddel, and all those others saw that it was not a menace.

"Unguh," said Keddel softly through the silence. "What a favor he is doing his planet! Fire is a purifier."

He left his place, walked slowly down the line, gripping hands, looking deep into each pair of eyes. "Good-by, Duran! Good-by, Dinal! Good-by, Dray! Good-by— And Teth," he said softly. He stooped and kissed her and turned away.

He went back along the line, pressing a soft little object into each hand.

"Seat yourselves," he then commanded. They complied, reacting to his persuasive voice as they would to a hypnotic.

He stood looking at them, regretfully, his eyes haunted still with that wistful expression.

An eddy of smoke swirled over the table. The corridor belched forth choking fumes. Far down that corridor they could see the blood-red haze of fire, eating that

section of the long house. In an instant the land outside was obliterated by a blast of flame that shot up past the windows.

Unguh had truly made a fire. This one, to date, was his largest creation. Was it merely fancy that brought to them, above the roar of swiftly propagating fire, a poisonous, screaming flow of words? They could not know. But they could not easily believe, after having listened to Unguh's firm grasp on the foul by-products of his native tongue, that it would be like him to fail to express his incarnate enthusiasm by not giving birth at this, his supreme moment, to the appropriate words.

Keddel leaned forward, his red eyes all the redder because of the flame reflected in them.

"The time has come. There is one last drink left to you. Fill your goblets!"

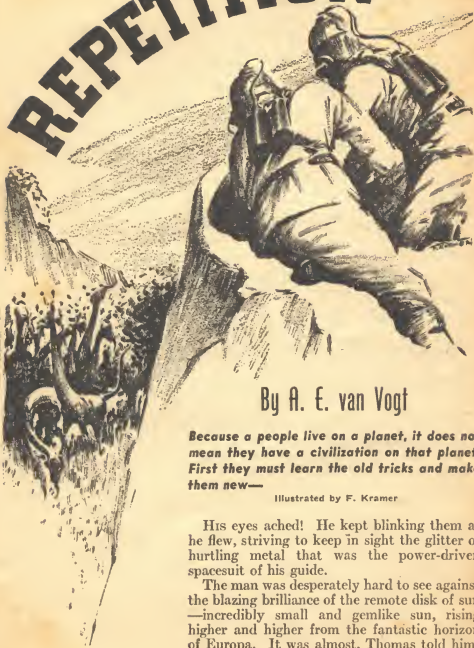
Cay's arm seemed to move through no volition of his own. He filled Teth's goblet, and then his own; and as he looked at her, he found that his lips could say nothing to her that his eyes on hers could not say better.

Keddel went on, remorselessly: "Take the pellet! Drop it in—like this!" His voice, magnetic, persuasive, insidious, came to them clearly above the crackling of flames. Slowly he raised the goblet to his lips. His voice came clear and brittle. "Drink it—like this!" He drank.

As one, those others drank. A toast to death.

Teth murmured softly, "Thanks, Cay, thanks. It was such a lovely fruit; as lovely as life." Her soft, puzzled eyes held his to the last. "And we shall have no more of either."

REPETITION



By A. E. van Vogt

Because a people live on a planet, it does not mean they have a civilization on that planet. First they must learn the old tricks and make them new—

Illustrated by F. Kramer

His eyes ached! He kept blinking them as he flew, striving to keep in sight the glitter of hurtling metal that was the power-driven spacesuit of his guide.

The man was desperately hard to see against the blazing brilliance of the remote disk of sun—incredibly small and gemlike sun, rising higher and higher from the fantastic horizon of Europa. It was almost, Thomas told himself, as if the guide was deliberately holding himself into the glare of the morning sun to dis-

tract his—Thomas'—wearying mind and dull his strength.

More than a mile below, a scatter of forest spread unevenly over a grim, forbidding land. Pock-marked rock, tortured gravel, and occasionally a sparse, reluctant growth of Jupiter grass that shown as brown and uninviting as the bare straggle of forest—and was gone into distance as they sped far above, two shining things of metal, darting along with the speed of shooting stars.

Several times Thomas saw herds of the tall, dapple-gray grass eaters below; and once, far to the left, he caught the sheeny glint of a scale-armored, blood-sucker gryb.

It was hard to see his speedometer, built into the transparent head-piece of his flying space armor—hard because he had on a second head-piece underneath, attached to his electrically heated clothes; and the light from the sun split dazzlingly through the two barriers. But now that his suspicions were aroused, he strained his eyes against that glare until they watered and blurred. What he saw tightened his heavy jaw into a thin, hard line. He snapped into his communicators, his voice as cold and hard as his thoughts: "Hey, you ahead there—what's your name? Barkett, Birkett—"

"Bartlett, sir!" a young man's voice sounded in his communicators; and it seemed to the older man's alert hearing that the accent on the "sir" held the faintest suggestion of a sneer, and a definite hostility. "Ray Bartlett! What is it, sir?"

"You told me this trip would be five hundred and twenty-one miles or—"

"Or thereabouts!" The reply was swift, but the sneer was stronger, the hostility more apparent, more intentional.

Thomas' eyes narrowed to steely gray slits. "You said five hundred and twenty-one miles. The figure is odd enough to be presumed exact, and there is no possibility that you would not know the exact distance from the Five Cities to the platinum mines. We have now traveled five hundred and twenty-nine miles—more every minute—since leaving the Five Cities a little over an hour ago, and—"

"So we have!" interrupted the young man with unmistakable insolence. "Now isn't that too bad, Mr. Famous Statesman Former Explorer Thomas."

Thomas was silent, examining the situation for its potential menace. His first indignant impulse was to pursue the unexpected arrogance of the other, but his brain, suddenly crystal-clear, throttled the desire and leaped ahead in a blaze of speculation.

There was murder intent here. His mind ticked coldly, with a sense of something repeated; for the threat of death he had faced before, during those bold, tremendous years when he had roamed the farthest planets. It was icily comforting to know that this was but a repetition of what he had previously experienced—comforting to remember that he had conquered in the past. In murder, as in everything else, experience counted.

THOMAS BEGAN to decelerate against the fury of built-up velocity. It would take time—but perhaps there still was time, though the other's attitude suggested the crisis was dangerously near. There was no more he could do till he had slowed considerably. Thomas quieted his leaping pulses and said gently:

"Tell me, is the whole community

in on this murder? Or is it a scheme of your own?"

"There's no harm in telling you now!" Bartlett retorted. "We knew in advance that your visit here was a farce. Ostensibly you came to find out for the Earth government if this moon of Jupiter was worth fighting about; actually, the government had decided in advance that they weren't going to fight, and you, with your terrific reputation, were to come here and put the thing over, pretending to be fair, but—"

His voice broke in a flare of hate: "You sneaking coward! What about the folks who've been trying to make a living here, slaving, hoping, dreaming, planning, creating for the future? And for what! So that a bunch of cynical politicians can sell us down the river to a dirty, arrogant gang of Martians."

Thomas laughed, a hard, humorless but understanding laugh that hid the slow caution with which he slanted toward the ground. The strain of the curving dive racked his body, tore at his lungs, but he held it off grimly.

He was alone in the sky now; the shining spacesuit of the guide had vanished into the dim distance. Evidently the man had not turned his head or noticed the deviation on his finder. Anxious for the discovery to be as long delayed as possible, Thomas said:

"So that's it. I see that I am now confronted with the emotional immaturities of a bunch of child minds. I wonder if the human race will ever grow up. Don't you know that at one time the world was divided into warring nations, and before that into fiercely patriotic States; and before that human beings owed their loyalties to towns? Will we always have such fools to contend with? Well-meaning fools, who understand nothing

of political, social or vital economy, and are perpetually victims of their own undisciplined desires and emotional incoherencies."

"Yaah!" Ray Bartlett snarled. "That kind of talk may go over big in the drawing rooms of London and New York, but it's plain rot to the men and women who stand to lose their homes. You're going to die because we're not letting you get back with any lying story about Europa. We're going to fake up some notes in your handwriting—we've got a handwriting expert—and then we'll give the notes to the newspapers; and let the government try to back out after that. With you dead—"

Thomas asked grimly: "And how are you going to kill me?"

"In about ten seconds," the young man began taunting, "your engine—" He broke off. "Hah, you're not behind me any more. So you're trying to land. Well, it won't do you any good, damn your soul! I'll be right back that way—"

Thomas was only fifty feet from the bleak rock when there was a sudden grinding in the hitherto silent mechanism of his atomic motor. The deadly swiftness of what happened then left no time for more than instinctive action. He felt a pain against his legs, a sharp, tearing pain, a dizzy, burning sensation that staggered his reason—and then he had struck the ground—and with a wild, automatic motion jerked off the power that was being so horribly short-circuited, that was burning him alive. Darkness closed over his brain like an engulfing blanket—

THE BLURRED WORLD of rock swaying and swirling about him—that was Thomas' awakening! He forced himself to consciousness and realized after a moment of mental blankness that he was no longer in his space-

suit. And, when he opened his eyes he could see without a sense of dazzle, now that he had only the one helmet—the one attached to his electrically heated clothes. He grew aware of something—an edge of rock—pressing painfully into his back. Dizzily, but with sane eyes, he looked up at a lean-faced young man, who was kneeling beside him.

The young man—Ray Bartlett—returned his gaze with unsmiling hostility, and said curtly:

"You're lucky to be alive. Obviously you shut off the motor just in time. It was being shorted by lead grit, and burned your legs a little. I've put some salve on, so you won't feel any pain; and you'll be able to walk."

He stopped and climbed to his feet. Thomas shook his head to clear away the black spots, and then gazed up at the other questioningly, but he said nothing. The young man seemed to realize what was in his mind.

"I didn't think I'd be squeamish with so much at stake," he confessed almost roughly, "but I am. I came back to kill you, but I wouldn't even kill a dog without giving him a chance. Well, you've got your chance, if it's worth anything."

Thomas sat up, his eyes narrowed on the young man's face inside the other's helmet. Ray Bartlett was a handsome young fellow with a pleasing countenance that ordinarily must have been frank and open. It was an honest face, twisted now with resentment and a sort of dogged determination.

Frowning with thought, Thomas looked around; and his eyes, trained for detail, saw a lack in the picture.

"Where's your spacesuit?"

Ray Bartlett nodded his head skyward. His voice held no quality of friendliness as he said: "If your eyes

are good, you'll see a dark spot, almost invisible now, to the right of the sun. I chained your suit to mine, then gave mine power. They'll be falling into Jupiter about three hundred hours from now."

Thomas pondered that matter-of-factly. "You'll pardon me if I don't quite believe that you've decided to stay and die with me. I know that men will die for what they believe to be right. But I can't quite follow the logic of why you should die. No doubt you have made arrangements to be rescued."

Ray Bartlett flushed, his face growing dark with the turgid wave of angry color. "There'll be no rescue," he growled from his throat. "I didn't like what you said about undisciplined desires and emotional immaturities. I know what you meant—that we of the Five Cities were thinking selfishly of ourselves, blind to the general welfare. I'm going to prove to you that, in this matter, no individual in our community thinks of himself. I'm going to die here with you because, naturally, we'll never reach the Five Cities on foot, and as for the platinum mines, they're even farther away."

"Pure bravado!" Thomas said. "In the first place your staying with me proves nothing but that you're a fool; in the second, I am incapable of admiring such an action. However, I'm glad you're here with me, and I appreciate the salve on these burns."

THOMAS CLIMBED gingerly to his feet, testing his legs, first the right, then the left, and felt a little sickening surge of dizziness that he fought back with an effort. "Hm-m-m," he commented aloud in the same matter-of-fact manner as before. "No pain, but weak. That salve ought to have healed the burns by dark."

"You take it very calmly," said Ray Bartlett acridly.

Thomas nodded his powerfully built head. "I'm always glad to realize I'm alive; and I feel that I can convince you that the course being pursued by the government of which I am a minister is the only sane one."

The young man laughed harshly. "Fat chance. Besides, it doesn't matter. You don't seem to realize our predicament. We're at least twelve days from civilization—that's figuring sixty miles a day, which is hardly possible. Tonight, the temperature will fall to a hundred below freezing, at least, though it varies down to as low as a hundred and seventy-five below, depending on the shifting of Europa's core, which is very hot, you know, and very close to the surface at times. That's why human beings—and other life—can exist on this moon at all. The core is jockeyed around by the Sun and Jupiter, with the Sun dominating, so that it's always fairly warm in the daytime and why, also, when the pull is on the other side of the planet, it's so devilish cold at night. I'm explaining this to you, so you'll have an idea of what it's all about."

"Go on," Thomas replied without comment.

"Well, if the cold doesn't kill us, we're bound to run into at least one bloodsucker gryb every few days. They can smell human blood at an astounding distance; and blood for some chemical reason drives them mad with desire. Once they corner a human being it's all up. They tear down the largest trees, or dig into caves through solid rock. The only protection is an atomic gun, and ours went up with our suits. We've only got my hunting knife. Besides all that, our only possible food is the giant grass eater, which runs like a

deer at the first sight of anything living, and which, besides, could kill a dozen unarmed men if it was cornered. You'll be surprised how hungry it is possible to get within a short time. Something in the air—and, of course, we're breathing filtered European air—speeds up normal digestion. We'll be starving to death in a couple of hours."

"It seems to give you a sort of mournful satisfaction," Thomas said dryly.

The young man flashed: "I'm here to see that you don't get back alive to the settlement, that's all."

Thomas scarcely heard him. His face was screwed into a black frown. "The more you tell me, the more I am convinced that the human beings on Europa are a sorry lot, not true pioneers. They've been here fifty years, and they've built their cities with machines, and machine-operated their mines—and not a single individual has rooted himself in the soil. No one has learned to exist without the luxuries that were brought from Earth. You talk of their having slaved and created. Bah! I tell you, Ray Bartlett, this is a terrible indictment of these so-called pioneers of yours, who simply moved the equivalent of an Earth city here and live an artificial life, longing for the day, no doubt, when they're wealthy enough to get back to the real thing."

The young man retorted grimly: "Yes. Well, you try living off the soil of this barren moon—try killing a gryb with your bare hands."

"Not my hands," replied Thomas as grimly. "My brains and my experience. We're going to get back to the Five Cities in spite of these natural obstacles, in spite of you!"

IN THE SILENCE that followed, Thomas examined their surround-

ings. He felt his first real chill of doubt as his eyes and mind took in that wild and desolate hell of rock that stretched to every horizon. No, not every! Barely visible in the remote distance of the direction they would have to go was a dark mist of black cliff.

It seemed to swim there against the haze of semiblackness that was the sky beyond the horizon. In the near distance the piling rock showed fantastic shapes, as if frozen in a state of writhing anguish. And there was no beauty in it, no sweep of grandeur, simply endless, desperate miles of black, tortured *deadness*—and silence!

He grew aware of the silence with a start that pierced his body like a physical shock. The silence seemed suddenly alive. It pressed unrelentingly down upon that flat stretch of rock where they stood. A malevolent silence that kept on and on, without echoes, without even a wind now to whistle and moan over the billion caves and gouged trenches that honeycombed the bleak, dark, treacherous land around them. A silence that seemed the very spirit of this harsh and deadly little world, here under that tiny, cold, brilliant sun, little more than a dazzling, distorted point in the blue-black sky.

"Gets you, doesn't it?" Ray Bartlett said, and there was a sneer in his voice.

Thomas stared at him, without exactly seeing him. His gaze was far away.

"Yes," he said thoughtfully. "I'd forgotten what it felt like; and I hadn't realized how much I'd forgotten. Well, we'd better get started."

As they leaped cautiously over the rock, assisted by the smaller gravitation of Europa, the young man said: "Perhaps you'll understand better how we, who've built cities and

homes on this far-away moon, feel about the prospect of being handed over to another government?"

"I am not," said Thomas curtly, "prepared to discuss the matter with a person who does not understand psychology, sociology, history and political economy. There is nothing more futile than arguing with someone who has no basis for his opinions but a vague backwash of emotions."

"We know what's right and what's human," Ray Bartlett replied icily. "We've got our scientists, too, and our engineers and teachers; and I'm here to see that their decision to kill you is carried out."

"You have only a knife now," Thomas commented, "and if you attacked me with that I'd have to show you the method employed by the Martian plainmen to disarm a man with a knife. It's very simple, really, and consistently effective."

"Yeah!" Ray Bartlett said roughly, his lean face tight, his formidable body tense. "What good would that do? I could still tear you apart with my bare hands."

Thomas slowed in his swift walking to glance at the other. "I venture to suggest that, with my wide experience in my favor, you could do nothing against me. However," he said hastily as the young man's dark eyes flashed with unfriendly intent, "I apologize for making a provocative remark. My words might properly be construed as a dare—in fact, all threats, however veiled behind apparent reason and moral uplift, are dares—and history teaches that such provocation produces an inevitable physical conflict. Tell me, what do you do for a living?"

"I'm a metal engineer!" Ray Bartlett said gruffly.

"Oh," Thomas' voice held a note of pleased surprise. "I see that I've

been underestimating you. No one will understand better than you the metal end of this business of Mars taking over Europa."

"Mars isn't taking over Europa!" Bartlett snapped. "And don't try to pull any flattery about how easy it should be for me to understand your subtle reasoning. I can see through that kind of stuff."

THOMAS ignored him. "Here are the figures. The Earth uses ten billion tons of steel every year; Mars two billion—"

"That's proof," Bartlett interjected, "that they wouldn't dare go to war with us, because even as it is, we sell them half their steel. If we cut that out, they couldn't maintain their industries to supply peacetime needs, let alone wartime. We can tell them to go stick it."

"You're quite wrong. Your reasoning is that of a newspaper correspondent who totals up the armaments of opposing sides and then says, 'Look, we've got more!' War is the great unknown, the unpredictable. A military genius with a million men can lick a proportionately well-armed two million men. Up to a certain point, war is a science like astronomy, then it becomes astrology. So far as science can help us, our general staff has decided that, strategically, we are in a bad way. While we do not actually believe we would lose, we could not guarantee a victory."

"That is the argument of conservative old women. They wouldn't dare to fight."

"Here's the breakdown of figures," Thomas went on calmly. "Half our steel, as well as the billion tons we sell to Mars, is mined with great difficulty on Jupiter. We couldn't operate those mines in case of war because the mines are hopelessly vul-

nerable to attack. That leaves us five billion. We couldn't operate the mines on Titan, which provide a scanty fifty million tons of steel, and, of course, Europa would be captured within a month of the war's beginning. The reason for all this is that it is militarily impossible for our ships to maintain the spacelanes between Earth and Jupiter, except at certain seasons of the year, when Mars was on the other side of the Sun from Jupiter. The Martians, however, would not start the war until the situation was favorable to them.

"Now, naturally, the Martians won't be able to operate the Jupiter mines under war conditions, but they should have no difficulty continuing operations on Ganymede, Io, Callisto, as well as Europa after they take it, and Titan, after they take that. Meantime, we'd have the supplies of Venus, the Moon and Earth, sufficient to supply us with some four billion tons a year. Considering the greater size of Earth, and the larger populations on Venus and Earth, they, with their smaller normally necessary needs, would actually have the advantage of us with their twelve hundred million tons.

"And all these mighty forces would be unleashed into a trillion-dollar war for what? To retain a paltry hundred million tons of steel—and other metals in proportion—from Europa. Naturally, we decided it wasn't worth it when we saw the way the political situation on Mars was tending toward one disastrous and inevitable end."

"You damned cowards!" Ray Bartlett snarled. "We're not fighting for steel. We're fighting to the last man and woman for our cities and our homes. Now, let's not talk about it any more. You make me sick with your cold, inhuman rea-

soning. Using human beings like pawns. Well, let me tell you, they're the only ones who count. Thank Heaven, you and I haven't a chance of getting out of this alive."

TWO HOURS later the Sun was high in those dark, gloomy heavens. It had been two hours of silence. Two hours while they tramped precariously along thin stretches of rock between fantastic valleys that yawned on either side, while they skirted the edges of caves whose bleak depths sheered straight down into the restless bowels of the Moon. Two hours of desolation.

The great black cliff, no longer misted by distance, loomed near and gigantic. As far as the eye could see it stretched to either side; and from where Thomas toiled and leaped ever more wearily, its wall seemed to rear up abrupt and glassy and unscalable. He gasped:

"I didn't realize I was so out of condition. I hate to confess it, but I'm not sure I can climb that cliff."

The young man turned a face toward him that had lost its brown healthiness in a gray, dull fatigue. A hint of fire came into his dark eyes.

"It's hunger!" he said curtly. "I told you what it would be like. We're starving."

Thomas pressed on, but after a moment slackened his pace, and said: "This grass eater—it also eats the smaller branches of trees, doesn't it?"

"Yes. That's what its long neck is for. What about it?"

"Is that all it eats?"

"That and Jupiter grass!"

"Nothing else?" Thomas' voice was sharp with question, his powerfully built face drawn tight with insistence. "Think, man!"

Ray Bartlett bridled. "Don't take

that tone to me. What's the use of all this, anyway?"

"Sorry—about the tone, I mean. What does it drink?"

"It licks ice. They always stay near the rivers. During the brief melting periods each year, all the water from the forests runs into the rivers and freezes. The only other thing it eats or drinks is salt. Like Earth animals, they absolutely have to have salt, and it's pretty rare."

"Salt! That's it!" Thomas' voice was triumphant. "We'll have to turn back. We passed a stretch of rock salt about a mile back. We'll have to get some."

"Go back! Are you crazy?"

Thomas stared at him, his eyes gray pools of steely glitter. "Listen, Bartlett, I said awhile ago that I didn't think I could climb those cliffs. Well, don't worry, I'll climb them. And I'll last through all today, and all tomorrow and the other twelve or fifteen or twenty days. I've put on about twenty-five pounds during the last ten years that I've been a cabinet minister. Well, dammit, my body'll use that as food, and by Heaven, I'll be alive and moving and going strong when you're staggering like a drunken sailor. I'll be alive when you're dead and buried for a hundred miles. But if we expect to kill a grass eater and live decently, we've got to have salt. I saw some salt, and we can't take a chance on passing it up. So back we go."

They glared at each other with the wild, tempestuous anger of two men whose nerves are on ultimate edge. Then Bartlett drew a deep breath and said:

"I don't know what your plan is, but it sounds crazy to me. Have you ever seen a grass eater? Well, it looks something like a giraffe, only it's bigger, and faster on its feet."

Maybe you've got some idea of tempting it with salt, and then killing it with a knife. I tell you, you can't get near it— But I'll go back with you. It doesn't matter, because we're going to die, no matter what you think. What I'm hoping is that a gryb sees us. It'll be quick that way."

"There is something," said Thomas, "pitiful and horrible about a young man who is determined to die."

"You don't think I want to die!" the young man flashed. "Why, I had everything to live for, until you came along with your miserable—"

His passionate voice died abruptly, but Thomas knew better than to let so much fierce feeling die unexplored.

"No doubt," he ventured softly, "there is a girl you love—"

He saw by the wretched look on the young man's face that he had struck home.

"Ah, well," said Thomas, "she'll probably marry someone else. There's always a second man who desires to taste of the manifold delights and charms of a beautiful and intelligent girl."

The young man said nothing; and Thomas realized his words had started a cruel train of thought in the other. He felt no compunction. It was absolutely imperative that Ray Bartlett develop a desire to live. In the crisis that seemed all too near now, his assistance might easily be the difference between life and death.

It was odd, the fever of talk that came upon Thomas as they laboriously retraced their steps to the salt rock. It was as if his tongue, of all his body, had become intoxicated; and yet his words, though swift, were not incoherent, but reasoned

and calculated to convince the younger man:

"Look at it this way. Your people, over a period of fifty years, have built five cities, with a total population of a million. You produce from your mines a hundred million tons of steel, a thousand tons of platinum, and about a hundred million tons of other metals—about two hundred million tons altogether. Of course, that's per year.

"Now, your engineers pointed out that estimates of Europa's recoverable metals indicated that in a thousand years the supply will be exhausted. In other words, there are two hundred billion tons of metal on this little moon, equal to twenty years of the normal needs of Earth. The value of the entire thousand years' supply, at an average of twenty dollars per ton, is four thousand billion dollars. I need hardly tell you that a war between Earth and Mars would cost ten times that much for each year that it lasted, not counting the hundred to two hundred million lives that would be destroyed in every conceivable horrible manner, the brutalizing of minds that would take place, the destruction of liberty that would ensue. Did the leaders of your community consider that in their deliberations?"

"I tell you," Ray Bartlett contended stubbornly, "the Martians won't fight, if you stand up to them and—"

"You keep repeating that like a parrot!" Thomas snapped. "The internal political situation on Mars has reached an explosive point. There are two groups on the planet—one ferociously hostile to Earth, the other—the government—believing in negotiation. We want that government to stay in power, but they haven't a chance in the elections this year unless they can show

material progress. Europa will be their answer—"

"Here's your salt!" Bartlett interrupted him curtly.

The salt rock composed a narrow ledge that protruded like a long fence which ran along in a startlingly straight line and ended abruptly at a canyon's edge, the fence rearing up, as if cringing back in frank dismay at finding itself teetering on the brink of an abyss.

Thomas picked up two pieces of salt rubble and slipped them into the capacious pockets of his plainsmanlike coat—and started back toward the dark wall of cliff nearly three miles away. He took up the thread of his argument where he had left off:

"And remember this, it's not only Europa's recoverable metals that will be used up in a thousand years, but also the metal resources of the entire Solar System. That's why we must have an equitable distribution now, because we can't afford to spend the last hundred of those thousand years fighting over metal with Mars. You see, in that thousand years we must reach the stars. We must develop speeds immeasurably greater than that of light—and in that last, urgent hundred years we must have their co-operation, not their enmity. Therefore they must not be dependent on us for anything; and we must not be under the continual mind-destroying temptation of being able to save ourselves for a few years longer if we sacrifice them.

Ray Bartlett said, rage nearly choking his voice: "I can see what you're trying to do—pretending that you're capable of thinking of the long-run welfare of the world. Well, forget it; you're not God. People get to believe they are, you know; and that they can so manipulate the

strings of their puppet ideas and puppet men that everything will inevitably happen as they desire. But we're not puppets, we human beings. In a thousand years, anything can happen."

He finished roughly: "And now I tell you again to shut up! I don't want to hear your arguments. You said before that the basis of our beliefs is different. You're damned right it is. So shut up, damn you! I'm so hungry that I can hardly stand up."

"Well," Thomas asked wearily, "what is the basis of your opinions? I am willing to debate on your basis."

The young man made no answer. They trudged along in silence.

THOMAS' BODY ached in every muscle, and every nerve pulsed alarms to his brain. He clung with a desperate, stubborn strength to each bit of rock projecting from the cliff wall, horribly aware that a slip meant death. Once he looked down, and his brain reeled in black dismay from the fearful depths that fell away behind him.

Through blurred vision he saw the young man a few feet away, the tortured lines of his face a grim reminder of the hunger weakness that was corroding the very roots of their two precariously held lives.

"Hang on!" Thomas gasped. "It's only a few more yards."

They made it, and collapsed on the very edge of that terrific chasm of cliff, too weary to climb the gentle slope that remained before they could look over the country beyond, too exhausted to do anything but lie there, sucking the life-giving air into their lungs. At last Ray Bartlett gasped:

"What's the use? If we had any

sense we'd jump off this cliff and get it over with."

"We can jump into a deep cave any time," Thomas retorted. "Let's get going."

He rose shakily to his feet, took a few steps, then stiffened and flung himself down with a hissing intake of his breath. His fingers grabbed the other's leg and jerked him back brutally to a prone position:

"Down for your life. There's a herd of grass eaters half a mile away. And they *mean* life for us."

Bartlett crawled up beside him, almost eagerly; and the two peered cautiously over the knob of rock out onto a grassy plain. The plain was somewhat below them, Thomas saw. To the left, a seant hundred yards away, like a wedge driven into the grassland, was the pointed edge of a forest. The grass beyond seemed almost like a projection of the forest growth. It, too, formed a wedge that petered out in bleak rock. At the far end of the grass was a herd of about half a hundred grass eaters.

"They're working this way!" Thomas said. "And they'll pass close to that wedge of trees."

A faint fire of irony edged Bartlett's voice as he said: "And what will you do—run out and put salt on their tails? I tell you, Thomas, we haven't got a thing that—"

"Our first course," said Thomas, unheeding, seeming to think out loud, "is to get into that thick belt of trees. We can do that by skirting along this cliff's edge, and putting the trees between us and the animals. Then you can loan me your knife."

"O. K.!" the young man agreed in a tired voice. "If you won't listen, you'll have to learn from experience. I tell you, you won't get within a quarter of a mile of those things."

"I don't want to," Thomas re-

plied. "You see, Bartlett, if you had more confidence in *life*, you'd realize that this problem of killing animals by cunning has been solved before. It's absolutely amazing how similarly it has been solved on different worlds, and under widely differing conditions. One would almost suspect a common evolution, but actually it is only a parallel situation producing a parallel solution. Just watch me."

"I'm willing," said Ray Bartlett. "There's almost any way I'd rather die than by starving. A meal of cooked grass eater is tough going, but it'll be pure heaven. Don't forget, though, that the bloodsucker grybs follow grass-eater herds, get as near as possible at night, then kill them in the morning when they're frozen. Right now, with darkness near, a gryb must be out there somewhere, hiding, sneaking nearer. Pretty soon he'll smell us, and then he'll—"

"We'll come to the gryb when he comes for us!" said Thomas calmly. "I'm sorry I never visited this moon in my younger days; these problems would all have been settled long ago. In the meantime, the forest is our goal."

THOMAS' OUTWARD calmness was but a mask for his inner excitement. His body literally shook with hunger and desire as they reached the safety of the forest. His fingers were trembling violently as he took Bartlett's knife and began to dig at the base of a great, bare, brown tree.

"It's the root, isn't it," he asked unsteadily, "that's so tough and springy that it's almost like fine tempered steel, and won't break even if it's bent into a circle? They call it eurood on Earth, and it's used in industry."

"Uh-huh!" Bartlett agreed. "What



"Down—climb down the pit. We can't kill that beast with a knife!"

are you going to do—make a bow? I suppose you could use a couple of grass blades in place of catgut. The grass is pretty strong and makes good rope."

"No," said Thomas. "I'm not making a bow and arrow. Mind you, I can shoot a pretty mean arrow. But I'm remembering what you said about not being able to get

within a quarter of a mile of the beasts."

He jerked out a root, which was about an inch in thickness, cut off a generous two-foot length, and began to sharpen, first one end, then the other.

It was hard going, harder than he had expected, because the knife skidded along the surface as if it was so much metal. Finally it obtained a cutting hold. "Makes a good edge and point," he commented. "And now, give me a hand in bending this double, while I tie some grass blades around to keep it that way."

"O-oh!" said Bartlett wonderingly. "I see-e-e! Say, that is clever. It'll make a mouthful about six inches in diameter. The grass-eater that gets it will gobble it up in one gulp to prevent any of the others getting the salt you're going to smear on it. His digestive juices will dissolve the grass string, the points will spring apart and tear the wall of his stomach, producing an internal hemorrhage."

"It's a method," said Thomas, "used by the primitives of Venus to kill the elusive Paamer deer; the Martian plainsman kills the water gopher with it, and, last but not least, our own Eskimo back on Earth uses it on wolves. Naturally, they all use different kinds of bait, but the principle is the same."

He made his way cautiously to the edge of the forest. From the shelter of a tree he flung the little piece of bent wood with all his strength. It landed in the grass a hundred and fifty feet away.

"We'd better make some more!" Thomas said. "We can't depend on one being found."

THE EATING was good; the cooked meat tough but tasty; and it was

good, too, to feel the flow of strength into his body. Thomas sighed at last and stood up, glanced at the sinking Sun, an orange-sized ball of flame in the western sky.

"We'll have to carry sixty Earth pounds of meat apiece; that's four pounds a day for the next fifteen days. Eating meat alone is dangerous; we may go insane, though it really requires about a month for that. We've got to carry the meat because we can't waste any more time killing grass eaters."

Thomas began to cut into the meaty part of the animal, which lay stretched out on the tough grass; and in a few minutes had tied together two light bundles. By braiding grass together, he made himself a pack sack and lifted the long shank of meat until it was strapped to his back. There was a little adjustment necessary to keep the weight from pressing his electrically heated clothes too tightly against him; when he looked up finally, he saw that the young man was looking at him peculiarly.

"You realize, of course," Bartlett said, "that you're quite insane now. It's true that, with these heated suits, we may be able to live through the cold of tonight, provided we find a deep cave. But don't think for a second that, once a gryb gets on our trail, we'll be able to throw it a piece of sharpened wood and expect it to have an internal hemorrhage."

"Why not?" Thomas asked; and his voice was sharp.

"Because it's the toughest creature ever spawned by a crazy evolution, the main reason I imagine why no intelligent form of life evolved on Europa. Its claws are literally diamond hard; its teeth can twist metals out of shape; its stomach wall can scarcely be cut with a knife, let alone a crudely pointed wood."

His voice took on a harsh note of exasperation: "I'm glad we've had this meal; starving wasn't my idea of a pleasant death. I want the quick death that the gryb will give us. But for Heaven's sake, get it out of your head that we shall live through this. I tell you, the monster will follow us into any cave, cleverly enlarge it wherever he has difficulty; and he'll get us because eventually we'll reach a dead end. They're not normal caves, you know, but meteor holes, the result of a cosmic cataclysm millions of years ago, and they're all twisted out of shape by the movement of the planet's crust. As for tonight, we'd better get busy and find a deep cave with plenty of twists in it, and perhaps a place where we can block the air currents from coming in. The winds will be arriving about a half an hour before the sun goes down, and our electric heaters won't be worth anything against those freezing blasts. It might pay us to gather some of the dead wood lying around, so we can build a fire at the really cold part of the night."

Getting the wood into the cave was simple enough. They gathered great armfuls of it, and tossed it down to where it formed a cluttering pile at the first twist in the tunnel. Then, having gathered all the loose wood in the vicinity, they lowered themselves down to the first level, Thomas first in a gingerly fashion; the young man—Thomas noticed—with a snap and spring. A smile crinkled the lips of the older man. The spirit of youth, he reflected, would not be suppressed.

They were just finishing throwing the wood down to the next level when suddenly a shadow darkened the cave mouth. Thomas glanced up with a terrible start and had a fleeting glimpse of great fanged jaws

and glowing eyes that glared from a hideous head; a thick red tongue licked out in unholy desire, and a spray of saliva rained down upon their transparent metal helmets and leatherlike clothes. And then Ray Bartlett's leather-covered hands bit like sharp stones into Thomas' arm; he felt himself dragged over the edge.

They landed unhurt among the loose pile of branches below; and scrambled frantically to throw it farther down. A great mad clawing and horrible bass mewing above them whipped them to desperate speed. They made it, as that enormous head peered down from the second level, visible only by the phosphorescent glow of its eyes, like two burning coals a foot and a half apart.

There was a terrific scrambling sound behind the two men as they pushed wildly down to the next level; a rock bounced down, narrowly missing them as it clattered past; and then, abruptly, silence and continuing darkness.

"What's happened?" Thomas asked in bewilderment.

There was bitterness in Ray Bartlett's voice as he replied: "It's wedged itself in, because it's realized it can't get us in the few minutes left before it freezes for the night; and, of course, now we won't be able to get out past it, with that great body squeezed against the rock sides.

"It's really a very clever animal in its way. It never chases grass eaters, but just follows them. It has discovered that it wakes up a few minutes before they do; naturally, it thinks we, too, will freeze, and that it will wake up before we will. In any event, it knows we can't get out. And we can't. We're finished."

ALL THAT long night, Thomas waited and watched. There were

times when he dozed, and there were times when he thought he was dozing, only to realize with a dreadful start that the horrible darkness had played devil's tricks on his mind.

The darkness during the early part of the night was like a weight that held them down. Not the faintest glimmer of natural light penetrated that Stygian night. And when, at last, they made a fire from their pile of brush, the pale, flickering flames pushed but feebly against the pressing, relentless force of the darkness and seemed helpless against the cold.

Thomas began to notice the cold, first as an uncomfortable chill that ate into his flesh, and then as a steady, almost painful, clamminess that struck into his very bones. The cold was noticeable, too, in the way white hoarfrost thickened on the walls. Great cracks appeared in the rock; and not once, but several times, sections of the ceiling collapsed with a roar that threatened their lives. The first clatter of falling debris seemed to waken Bartlett from a state of semicoma. He jerked to his feet; and Thomas watched him silently as he paced restlessly to and fro, clapping his gloved, heated hands together to keep them warm.

"Why not," Thomas asked, "go up and build a fire against the gryb's body? If we could burn him—"

"He'd just waken up," Bartlett said tersely, "and besides, his hide won't burn at ordinary temperatures. It has all the properties of metallic asbestos, conducts heat, but is practically noncombustible."

Thomas was silent, frowning; then: "The toughness of this creature is no joke—and the worst of it all is that our danger, the whole affair, has been utterly useless. Fake handwriting or not, my colleagues will know the truth and will suspect

foul play. Rumors to that effect will spread automatically through the press and develop into open vilification of the murderous Five Cities. Before you know it, there will be a swelling murmur of demand for retribution; and in such a dark atmosphere it will be the simplest matter in the world to hand Europa over to Mars. You think that's far-fetched, don't you?"

"It's crazy!" half whispered Ray Bartlett shakily.

"You may not realize it even now," Thomas went on, "but the person to have concentrated upon was myself. I don't think I am exaggerating when I say that any solution which I proposed would have been accepted. My reputation has been the conduct of a peculiar set of circumstances, but, once established, it acquired rocklike qualities. The report of my death will create a sensation and have all the effects that I have described."

"Well, what should we have done?" Ray Bartlett exclaimed with dark bitterness. "We showed you all our resources because we were determined to leave you no excuse. But what could we do against a person who thought in billions where we thought in millions? To you everything was small, unimportant. The full capacity of all our mines was just a drop in the tremendous maw of Earth's metal furnaces. What could we do?"

"Accept the situation!" Thomas shrugged. "What's the difference whether you sold your metal hereafter to Mars or to Earth; all you ever see are the big freight ships that come here and load up; there would be no objection to making a stipulation that the community have submitted to them the names of governors that Mars would place here,

from which they could take their choice. We could also stipulate that the Martians live in separate cities to begin with, and that all business relations between individuals be on a purely voluntary basis; and, oh, a hundred other stipulations could be made, to be effective during, say, the first fifty years."

"I don't really suppose it matters," the young man said gloomily. "I suppose we are stupid fools to object to being handed over like a herd of sheep. It's our pride, and, in a kind of way, I can see your point about the unfairness of the distribution of natural resources. Oh, Lord, here am I talking again. What's the use of you and I arguing on this subject? It's too late. In a few hours that damn thing that's got us sealed in here will wake up and finish us. There's nothing we've got that can hold it back one inch, or one second."

"Don't be so sure of that!" Thomas said. "I admit the toughness of this monster has got me worried sick, but don't forget what I've said: These problems have been solved before on other planets."

"You're mad! I tell you, sir, even with an atomic gun it's touch and go getting the gryb before it gets you. Its hide is so tough it won't begin to disintegrate until your heart's in your boots. What can we do against a thing like that when all we've got is a knife?"

"Let me have the knife," Thomas replied. "I want to sharpen it."

His face twisted into a wry smile. Perhaps it didn't mean much, but the young man had called him "sir" quite unconsciously. There were psychological implications in the use of the word.

THE SUSTAINED darkness of that night, the insistent crackle of the

palely flickering fire seemed to become more and more alive as the nervous hours twitched by. It was Thomas who was pacing now, his medium-tall, powerful body restless and tense with anxious uncertainty.

It was getting distinctly warmer; the white hoarfrost was melting in places, yielding for the first time to the heat of the spluttering flames; and the chill was no longer reaching clammy through his heated clothes.

A scatter of fine ashes lay on the ground, indication of how completely the fuel had burned away; but even as it was the cave was beginning to show a haze of smoke fumes, through which it was difficult to see properly.

Abruptly there was a ~~gront~~ stirring above them; and then a deep, eager mewling, and a scrambling, scratching sound. Ray Bartlett jerked erect from where he had been lying and leaped to his feet. He gasped:

"It's awake, and it's remembered."

"Well," said Thomas grimly, "this is what you've been longing for."

From across the fire the young man stared at him moodily. He said harshly: "You don't think I want to die, do you? Besides, I'm beginning to see that killing you will solve nothing. It was a mad scheme."

"You agree, then," said Thomas, "that people who have not rooted themselves into a land, but are simply exploiting it, have no right to expect the living, vital organism of the people to which they belong, to risk a death blow in order to protect them and their purely artificial structure?"

"Oh, I don't know what I think!" Ray Bartlett exclaimed. "For Heaven's sake, let's quit quibbling. That damned thing—"

A rock bounded down and crashed between them, missing the fire, then

vanishing noisily into the darkness beyond. There followed a horrible squeezing, a rasping sound as of brittle scales scraping rock; and then, terribly near, the drumming sound as of a monstrous sledge hammer at work.

"He's breaking off a piece of rock!" Bartlett panted. "Quick! Get into a concavity against the wall. Those rocks may come tumbling down here, and they won't miss us forever— What are you doing?"

"I'm afraid," said Thomas in a shaky voice, "I've got to risk the rock. There's no time to waste."

His leather-covered hands trembled with the excitement that gripped him as he hastily unfastened one of the glove extensions. He winced a little as his hand emerged into the open air, and immediately jerked it over the hot flame of the fire.

"Phew, it's cold. Must still be about ninety below. I'll have to warm this knife or it'll stick to my skin."

He held the blade into the flame, finally withdrew it, made a neat incision in the thumb of his bare hand, and wiped the blood onto the knife blade, smearing it on until his hand, blue with the cold, refused to bleed any more. Then he quickly slipped it back into its glove.

It tingled as it warmed, but in spite of the pain he picked up a flaming faggot by its unburned end and walked along into the darkness, his eyes searching the floor. He was vaguely aware of the young man following him.

"Ah," Thomas said, and even in his own ears his voice sounded wrenched from him. He knelt quivering beside a thin crack in the rock. "This'll be just about right. It's practically against the wall, pro-

tected from falling rocks by this projecting edge of wall."

He glanced up at Bartlett. "The reason I had us camp here last night instead of farther down was because this ledge is nearly sixty feet long. The gryb is about thirty feet long from tail to snout, isn't it?"

"Yes!"

"Well, this will give it room to come down and walk a few feet; and besides, the cave is wide enough here for us to squeeze past it when it's dead."

"When it's dead!" the young man echoed with a groan. "You must be the world's prize fool—"

Thomas scarcely heard him. He was carefully inserting the handle of the knife into the crack of the rock, wedging it in. He tested it.

"Hm-m-m, it seems solid enough. But we'll have to make doubly sure."

"Hurry!" Bartlett exclaimed. "We've got to get down to the next level. There's just a chance that there is a connection somewhere below with another cave."

"There isn't! I went down to investigate while you were sleeping. There are only two more levels after this."

"For Heaven's sake, man, it'll be here in a minute."

"A minute is all I need!" Thomas replied, struggling to calm his clamoring heart, to slow the convulsive gasping of his lungs. "I want to pound these slivers of rock beside the knife to brace it."

And Thomas pounded, while Bartlett danced frantically from one foot to another in a perfect panic of anxiety. He pounded while that scrambling from above became a roaring confusion, so near now that it was deafening. He pounded while his nerves jangled and shook from the

hellish bass mewing that blasted down from the ravenous beast.

And then, with a gasp, he flung aside the piece of rock with which he had been hammering; and the two men lowered themselves recklessly over the edge—just as two great glowing eyes peered down upon them.

The firelight revealed the vague outlines of a dark, fanged mouth, a thick, twisting tongue; and then there was a scaly glitter as the monstrosity plunged downward right onto the fire.

Thomas saw no more. He let go his hold and skittered downward for nearly twenty feet before he struck bottom. For a minute he lay there, too dizzy to realize that the scrambling noise from above had stopped.

Instead there was a low grunting of pain, and then a sucking sound.

"What the dickens!" Ray Bartlett muttered.

"Wait!" Thomas whispered tensely.

They waited what must have been five minutes, then ten—half an hour. The sucking sound above was weaker. An overtone of wheezing accompanied it, and the grunts had stopped. Once there was a low, hoarse moan of agony.

"Help me up!" Thomas whispered.

"I want to see how close it is to death."

"Listen," snapped Ray Bartlett, "either you're mad or I'm going to be. For Heaven's sake, what's it doing?"

"It smelled the blood on the knife," Thomas replied, "and began to lick it. The licking cut its tongue into ribbons, which whipped it into a frenzy, because with every lick more of its own blood would flow into its mouth. You say it loves blood. For the last half-hour it's been gorging itself on its own blood. Primitive stuff, common to all the planets. Civilized men, apparently, never think of things like that."

"I guess," Ray Bartlett said in a queer voice after a long moment, "there's nothing now to prevent us getting back to the Five Cities."

Thomas stared with narrowed eyes at the other's vague bulk in the darkness. "Nothing, except—you!"

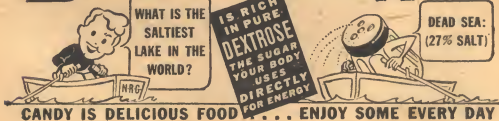
They climbed in silence to where the gryb lay dead. Thomas was aware of Bartlett watching him as he gingerly removed the knife from where it was wedged into the rock. Then abruptly, harshly, Bartlett said:

"Give me that!"

Thomas hesitated, then handed the knife over. It was possible he

BUTTERFINGER⁵

CURTISS



would have to take the terrific risk of telling young Bartlett the truth about this whole business. For undoubtedly the younger man was once again all enemy.

OUTSIDE, the morning, greeted them, bleak, yet somehow more inviting. The little red Sun was well above the horizon, and something else was in the sky, too: a huge red ball of pale fire, Jupiter the giant, sinking now toward the western horizon.

The sky, the world of Europa, was lighter, brighter; even the rocks didn't look so dead, nor so black. A strong wind was blowing; and it added to the sense of life. The morning seemed cheerful after the black night, as if hope was once again possible.

"It's a false hope," thought Thomas. "The Lord save me from the stubborn duty sense of an honest man. He's going to attack."

Yet the fury of attack, when it came, surpassed his expectations. He caught the movement, the flash of the knife out of the corner of his eye—and whipped aside.

The knife caught the resisting fabric of the arm of his electrically heated suit, scraped a foot-long scar on that obstinate, half-metallic substance, and then Thomas was dancing away along a ledge of firm rock.

"You . . . silly . . . fool!" he gasped. "You don't know what you're doing."

"You bet I know!" Bartlett ground out. "I've got orders to kill you, and I'm going to in spite of your silver tongue. You're the devil himself for talking, but now you die."

He leaped forward, knife poised, and Thomas let him come. There was a way of disarming a man with a knife, provided the man did not

know the method and provided it worked the first time.

Bartlett grunted as he leaped; his free hand grabbed at Thomas, and that was all Thomas needed. Just a damned amateur who didn't know knife fighters didn't try for holds.

Thomas snatched at the clawlike spread of that striking hand, caught it with grim strength and jerked the young man past him with every ounce of his power. As Bartlett shot by him, propelled by his own momentum as well as by that arm-wrenching pull, Thomas twisted along with him. At the last instant he braced himself for the shock and sent the two-hundred-pound body spinning along like a top.

Frantically, Ray Bartlett fought for balance. But there was no mercy in that rough ground. Upjutting rock snagged his feet; he fell with mind-stunning violence, kicked weakly and lay still.

Thomas picked up the knife from where it had fallen.

"I'll keep this," he said when the other's glazed eyes began to show animation. "But what am I going to do with you? We've got twelve days, at least, during which I'll be at your mercy a score of times a day. A swiftly heaved rock to smash my head, a sudden shove as we skirt some crater—"

"I'll . . . do . . . it . . . too."

Thomas frowned. "At least, you're honest. That makes it possible for me not to kill you, but to trust you with a secret so important that if the barest hint of it got out in advance it would shatter the greatest diplomatic stroke of the ages. But I must have your most sacred word of honor that not one word will escape you under any circumstances."

"I guess I can promise that!" Ray

Bartlett said in a thick, unsteady voice; then, with more fire: "But I'll see you in hell before I change my mind."

"You promise, nevertheless."

"Yes, I promise, but there's nothing—"

THOMAS cut him short: "There has never been a more enlightened group of men on Mars than the present government. If we hand over Europa to prove our good will to the doubters among the opposition, that government will, immediately on reelection, vote to join the Earth-Venus union. I need hardly tell you that the thing is so tremendous that it staggers the imagination. For the first time in the history of men—"

"Suppose they lose the election?"

"We can trust that crew of rabble-rousers to encroach immediately on the rights of the Europeans, as defined by the agreement we will draw up. Whereupon we shall declare the agreement null and void and take over Europa."

"Bah! That means war, and you wouldn't have the nerve."

Thomas' steely eyes gazed unflinchingly at the younger man. "Let me tell you that I am the dominating minister in the present Earth-Venus government; and I hope I have convinced you that fear is not one of my characteristics. My colleagues and I do not fear, but hate, war. However, we are convinced that war will not be necessary. The government on Mars will win the election; and I think that you agree with me there."

Bartlett muttered: "Getting Europa handed to them on a platter ought to swing any election, I guess."

Thomas ignored his surliness, and in a voice that was queerly husky he said: "I have talked of repetition being a rule of life. But somewhere along the pathway of the Universe there must be a first time for everything, a first peaceful solution along sound sociological lines of the antagonisms of great sovereign powers."

"Some day man will reach the stars, and all the old, old problems will repeat themselves. When that day comes, we must have established sanity in the very souls of men, so firmly rooted that there will be an endless repetition of peaceful solutions."

He stood up. "Think it over, and then decide for yourself whether you've got the nerve to face the recriminations of your friends for letting me come in alive. There's a dark, bitter period ahead for Europa, and the agony of your people will be heaped on your head. It's a hard choice."

In the West, mighty Jupiter was being engulfed by the blue, dark horizon, an age-old cycle repeating. The strong wind died, and there was quiet upon that wild, fantastic land. Thomas was aware of the young man walking behind him—too aware; it made him less alert for what was ahead.

Abruptly he stumbled to the edge of a jagged black hole that fell away into sheer, dreadful depths. He hung there, teetering, frantic, over the abyss.

And then two iron-hard hands caught his shoulder, jerked him back from that desperate danger.

"Be careful, sir!" breathed the anxious voice of Ray Bartlett. "Be careful, or you'll be killed."

IN TIMES TO COME



NEXT month, by chance, we had planned to feature the story "Space Guards," by Phil Nowlan, creator of the famous "Buck Rogers" cartoon strip. We say "by chance" because just yesterday we learned that Phil Nowlan died of a stroke. For ten years Nowlan has been out of the science-fiction writing field, devoting his time to the Buck Rogers cartoons; only recently, within the last six months, had he begun to work his way back into the field of written science-fiction, planning to start an entire new series of stories.

The quality of Nowlan's written science-fiction was certainly exceptionally high—even ten years ago, when the magazine science-fiction was only starting, the work Phil Nowlan did was of a grade that would have been acceptable and well rated against the much more highly evolved work of today. He had, then, developed one of the concepts that has only recently been generally recognized and used; the realization that the thought-patterns of the people of the future will necessarily be as different from the everyday thought-matrices of our present as their background must differ from ours.

"Space Guards," coming in the May Astounding, was to have been his first major work since his return to written science-fiction, a 20,000-word seminovell. Unfortunately, it will be not only his first, but his last.

Phil Nowlan had planned with me for a new series; sadly, in this announcement of "Space Guards," I cannot, as I then planned also announce that a new series by Phil Nowlan will begin. Phil Nowlan is gone, and with him an entire civilization he was building in a keen and ingenious mind.

THE EDITOR.

THE TREASURE OF PTAKUTH

By Leigh Brackett

*The treasure was invaluable, inestimable—
like the product of infinity times zero. For,
in a way, it was both—zero and infinity, too.*

Illustrated by Hubert Rogers

TERRY SHANE stood in his deserted camp and swore. To his left the red Martian desert stretched in waterless desolation to the horizon. To his right, perhaps fifty yards away, rose a range of barren hills, low and worn by the press of ages. And at his feet was all the equipment the deserting bearers had left him; a canteen that might, with careful nursing, take him across the desert to the oasis of Morn, whence he had just come.

"By the holy saints!" swore Terence Shane, in a fury as black as his hair; "I'll not be frightened from Ptakuth by any crawling seut that hides his face in the dark!"

The note in his hand mocked him. It had been pinned on his tent flap, and it said: "Your bearers have finally been persuaded to go home. Since you have proved obstinate, I can only say I hope you'll change your mind before you run into trouble. Having heard Terence Shane's boast that he never knows fear, I'm afraid you won't. But in all fairness, I warn you again: stay away from Ptakuth!"

It was signed *Thaldrek of Ved*. Shane knew of him. Everyone in the System knew of the Martian adventurer who sold valuable secrets to the highest bidder, and was never caught. Shane crumpled the paper in his great muscular hand

and flung it away. Picking up the canteen, he swung off toward the hills which hid the lost city of Ptakuth from the world.

He found the place he was looking for: a gap where the mouth of a dry river joined the dry sea. Somewhere up the course of that dry river lay the cliff city of Ptakuth, cursed and lost for centuries that made Shane's head reel with the thinking of them. There were legends of Ptakuth on Mars as there were legends of Atlantis on Earth, and the gray-bearded men of the Martian Archeological Foundation had paid adventurer Terry Shane a goodly sum to find it for them.

The rock walls and the sand floor hurled the Martian sunlight on Shane until he was soaked with sweat and parched with thirst. He endured the thirst. There might be no water for miles, if at all.

"And if there is water," he reflected, "there'll surely be barbarians. Shuuni, in this part of Mars, and tough lads in a fight. Well, I've been paid to find Ptakuth, and I've come too far to turn back now!"

In his heart he knew that wasn't the reason. The real reason was that someone wanted what he wanted, and dared him to come and get it.

He was climbing a narrow trail alongside the river bed when he



"Two minutes, Shane," said Thaldrek, "and the time bomb is still to be destroyed! Can you reach it—"

heard the sound. It came from across the gorge, beating down from the rocky walls in broken, maddening echoes; a low, sonorous note like a bell clanging. Shane shook his dark head in pain. The sound set his eardrums to banging in and out,

benused his brain, enraged him, because he sensed a definite purpose behind it. There was nothing in these naked hills to make such a sound, except a man-made agency.

Furious, trembling with the pain of his ears, he put his hands over

them and went on. Abruptly the sound stopped. His head vibrated dizzily for a moment. Then there was blessed silence. Frowning, Shane climbed on.

THERE WAS a faint noise high on the cliff top above him, and a pebble bounced on the path at his feet. Someone was up there, climbing cat-footed over the rocks, spying on him. Shunni barbarians, or the man who had left that taunting note on his tent flap? Shane's gray eyes were keen, his hand ready on the butt of his proton gun. But there was nothing but empty silence.

The musical note came again, lower in pitch so that it took his very heartbeats and shook them. The vibrations hammered at him from the cliffs, from the rocks on the bottom of the gorge, from the trail at his feet, booming and thudding and setting every atom of his body and brain aquiver with them. Shane had heard of a similar thing; how certain Venusian tribes used musical notes to torture their victims, letting constant vibration send them mad after days of agony.

The very rock quivered under his feet; the cliff beside him, when he touched it, sent the low-pitched pulsing shooting through him. His jaws rang against one another like a tuning fork, and his brain was a darkened, shuddering anguish.

It stopped, and he was weak with the silence. Flexing his great shoulders, he bellowed defiance across the empty gorge, but there was no answer. And he wondered, if the sound came again, if he could fight ahead against it.

"Faith," he said suddenly, "that's it! A warning, to make me go back."

His jaw set to an ugly line, and

he went on, speeding his pace in the blinding heat.

Still he was conscious of watchers above him; faint clicks of metal on stone, a pebble dislodged from the crumbling rock. "Shunni," he decided, "because the notes came from across the gorge, and it's no barbarian making *those*."

Sound again, this time a high-pitched screaming that was just within hearing range. Shane cried out before he knew it. The sound was like a knife in his head, a thousand times worse than the low note. It sang itself into the very bones of his skull, piercing and shrilling, maddening him with the pain of it. Nothing would shut it out. Shane raged at his weakness; pain, privation, danger, he had stood without flinching. But this he couldn't fight; it got hold of his brain and sent him wild as a frantic horse.

He knew it was the last warning. He knew he wouldn't have obeyed it if he could. But he was frantic, insane, driven by the piercing shriek in his head.

He ran with all his strength, up the trail and through a sort of unroofed tunnel. And then, abruptly, he stopped. The agonizing shriek snapped off short. And Shane's hand dropped to his gun butt.

He had come out into what had once been a semicircular plateau, cupped in the wind-worn hills. Standing negligently at ease on the reddish earth were some two hundred Shunni warriors; great swarthy men in gaudy kilts and leather harness, bearing spears almost twice as long as Shane was high.

Shane's head turned quickly at a noise behind him. Then his hand dropped the half-drawn gun casually back in its holster. Tall warriors filled the tunnel back of him; he shrugged and followed their

pointing spears out onto the plain.

Then, for the second time, he stopped.

"Faith," he murmured, "it's sun-stroke I have, and this a vision come to comfort me!"

THE GIRL had come from behind the front rank of Shunni. She had sun-brown hair and hazel eyes and a queenly way about her, and the blue skirt and copper corselet she wore only made her gorgeousness a little more patently gorgeous. Shane set his thumbs in his belt and smiled, watching the glitter and swish of her as she came to stand in front of him.

In a minute he'd try the Martian dialects he knew. But now: "Girl, you're as pretty as Shaughnessy's little brown pig!"

"Thanks," said the girl, in perfect English. "You're not bad-looking yourself. Who are you, and what are you doing here?"

She laughed as Shane's tongue tried to come out of the paralysis of surprise; the clear, merry sound brought a shamed flush to the man's cheeks.

"You make a man's tongue speak out of turn, girl. I'm Terence Shane, heading an expedition for the Martian Archeological Foundation."

The girl frowned. "Expedition?"

Shane nodded. "My bearers left me back on the desert. I'm hunting for Ptakuth; it's a lost city somewhere in these hills."

The girl's face darkened. "The city," she said slowly, "with the treasure."

"Treasure?" Shane shook his head. "Perhaps they mentioned one, along with the curse and the destruction, but it means little." He grinned, looking down at her. "Who are you?"

The girl met his eyes for a long

minute. Then, "Zenda Challoner," she said, as though it meant a lot.

The name struck an echo way back in the hazy corridors of Shane's memory, but whatever it might have meant was sidetracked in a sudden clamor in back of him. Shane swung to follow the girl's gaze, and his bronzed face hardened.

A group of warriors had come through the tunnel, and they had a captive; a slight, fair man, dressed like Shane in spun-glass tunic and shorts. The Irishman, looking at the newcomer's high-boned, hawk-clean face, murmured: "Thaldrek of Ved, by the devil himself."

Zenda Challoner smiled, and Shane found it difficult to believe that an angel's face could produce such a hard, mirthless expression. It was like a bared and sharpened spear point.

"Where did you get this one?" she demanded.

The leader grinned.

"On the other side of the river, *xanara*, beside a spaceship. Will there be sport tonight?"

There was a nasty thought behind that last, Shane felt. Zenda shook her head, saying brusquely: "Are you an archaeologist, too?"

The stranger had an easy smile. "No, *xanara*. I am—" His eyes, long, cloud-colored Venusian eyes in a Martian face, caught Shane's with suppressed laughter in them. "I'm Thaldrek of Ved, a dealer in—well, rare merchandise. My flier cracked up in the hills. Do I trespass?"

"You do," said Zenda Challoner curtly, and turned away with a gesture to the waiting Shunni.

In another minute Shane and Thaldrek, disarmed, were marching across the plateau and into a narrow defile, closely guarded by strapping barbarians.

The Martian grinned crookedly.

"Looks as though we're in a mess. Terence Shane."

Shane glared at him. Then, "I've been in tighter spots than this," he said, and his eyes went to Zenda Challoner.

Thaldrek grunted. "Some day," he said feelingly, "you'll meet something that'll throw the fear of God into you. And I hope I'm there to see it!"

THE RED Martian sunset was deepening when they reached the valley where the Shunni lived; a place of low cliffs honeycombed with caves, with little tilled fields along the course of a thin trickle of water. Shane noted the guards at the one entrance, and had to admit that leaving was going to be harder than getting in.

The two captives were permitted to wash and eat. Then, when full dark had fallen and there was a flare of torches and cooking fires in the chill air, they were taken to Zenda Challoner's cave.

A big cave, floored and cushioned with skins, with an incongruous metal lock box on a high shelf. Thaldrek of Ved saw it, and Shane noted the quick flame that burned and then was hidden in the Venusian's long, cloud-colored eyes.

Zenda Challoner watched them, lithe and lovely, from a couch of skins, their two guns under her hand, and her face was hard and troubled all at once.

"I don't know what to do with you," she said abruptly. "If I let you go, you'll come back with more men, and it will mean war. I don't wish to keep you prisoners here. And I don't want to kill you."

"Why, now," smiled Shane easily, "couldn't we just go on to Ptakuth as we planned, and nobody bother anybody?"

Thaldrek laughed. "Yes, *xanara*. Why not?"

Zenda Challoner frowned angrily. "Are you accomplices?"

Shane growled, and Thaldrek said quietly, "We know each other by reputation rather than acquaintance!"

"Then what is it? You're hiding something!"

"So are you." Shane moved closer to her. "Who are you? And why are you keeping us from Ptakuth?"

The brown-haired girl gave him a long, level look. "My father," she said quietly, "was a god."

For the second time Shane's tongue was enmeshed in startlement. "A god!"

Zenda nodded. "He was Harold Challoner, The-One-Who-Never-Sleeps. He came here from Outside, many years ago, and settled among the Shunni. They knew he was a god, because he never slept. He mated with a woman of the tribe, and when it came time for his body to go elsewhere, his soul entered my body, and I, his daughter, became goddess-queen in his place. He left a certain trust with me, a guardianship."

"Of Ptakuth," murmured Thaldrek. "Of course."

Again that nebulous tugging at Shane's memory. Somewhere before he had heard the name of Harold Challoner.

He said gently, "You're too pretty for a goddess, and too little for a queen. You sleep, don't you?"

"Of course. I have said my mother was a Shunni woman. Therefore I am only half god."

"But what of Ptakuth?" Thaldrek's face was keen as a questing wolf's.

The girl seemed perplexed for a moment; that look of troubled indecision came again to her face. "It

is forbidden," she said at length, "even to me." And she made an imperious gesture to a warrior standing guard.

As Thaldrek and Shane were led out, she said, "I will decide in the morning what to do with you."

Shane shrugged. With a colleen like that to deal with, no great harm could befall Terence Shane. But Thaldrek's keen face was set, his eyes unseeing with intense concentration.

BACK in their cave, alone except for half a dozen Shunni on guard around a fire on the ledge outside, Shane turned on the Martian.

"All right, Thaldrek, it's time now for speaking. What are you after?"

Thaldrek had come out of his thoughtful daze. There was a look about him as though he had made his decision, and the world lay at his feet. Again Shane noted the mingled strains in him: cloudy eyes of Venus, wiry liteness of Mars, and the fair hair some Earthman had given him, on a planet where the eternal sunlight makes most men dark. Shane could have broken Thaldrek's slim, supple body in his two hands, but he could not down a grudging respect.

"I am," smiled Thaldrek of Ved, "doing exactly what you're doing—looking for Ptakuth."

Shane grunted. "I'm getting paid for it, though. You'll not be taking up archaeology this late in life, will you?"

"Have you heard mention of a treasure?"

"So that's it!" Shane let go a roar of laughter. "Yes, and I've heard of a curse and a destruction, too. All legendary bosh, Thaldrek!"

"The-One-Who-Never-Sleeps isn't legendary bosh, Shane; his daughter sits there, ruling these barbarians,

believing she's a goddess, and guarding the door to Ptakuth. There must be a reason."

"Challoner. Harold Challoner. Got it! He headed an expedition in search of Ptakuth about twenty years ago. Did it with his own money, tried to keep it a secret. Disappeared, along with his three companions. He lived his life out here, of course. Wonder why he didn't come back, when he failed?"

"He didn't fail," said Thaldrek slowly. "Remember, he was The-One-Who-Never-Sleeps."

Shane stood over the Martian, and there was no humor in his face. "What is the treasure of Ptakuth, that you're so anxious to get it? And what's all this talk of Challoner never sleeping?"

Thaldrek smiled at Shane, his hands folded on his belt. There was something dangerous in his smile.

"The gods didn't give me the body of a bull," he said, "so I've been forced to develop brains. The first law of a full brain is a close tongue."

He glanced at the skin-curtained entrance. Then, quietly, he asked, "How would you like to escape?"

Shane glared at him. "I could probably kill those six guards, but it's very angry the rest of the Shunni would be! Surely you know our escape lies through Zenda."

"Dealing with women, eh?" The Martian's veiled eyes held a malicious amusement. "I've heard your boast, Terence Shane. Are you afraid?"

His laugh stopped the Irishman's angry roar, but his hands were still at his belt.

"Why, now," snarled Terry Shane, "is it an angel you'll bring from heaven to carry us off, or himself from down below?"

Thaldrek snapped the zipper of his tunic down to the belt.

Strapped tight against his muscular body was a web belt bearing two little square boxes, hidden by the blouse of the loose garment.

"An electro-vibrator," said Thaldrek. "Operates on tiny storage batteries, sending vibrations of ultra-sonic perception over a beam with a six-foot range. Really a miniature of the tonal apparatus I used on you back in the gorge. Small, but powerful. Watch."

He stood by the skin curtain, within four feet of the guards outside, manipulating the dials. As Shane listened, the talk and laughter died away. There was a clatter as someone's spear dropped. Then silence.

Thaldrek grinned. "Brains, Shane. Thought is electrical in principle; telepathy depends on electrical vibrations from one mind impinging on another. The ultra-sonic vibrations blank the conscious mind so that I can exercise complete control of anyone under its influence, provided I make the vibrations of my own mind strong enough through concentration. I told the guards to go to sleep."

"You win," grunted Shane. "But the holy saints keep me from tearing you apart before it's time!"

PHOBOS shot up out of the west as they stepped out onto the ledge among the sleeping guards, casting an ink-black shadow under the western wall of the valley. It was late, and the cooking fires had smoldered to ashes. What folk were still awake were in their caves, for the night was cold.

Prowling silently as cats down the well-worn trail in the moon-cast dark, Shane and Thaldrek made for Zenda's cave.

"How long will the guards sleep?" whispered Shane.

"About four hours," answered Thaldrek.

There were three guards on Zenda's ledge; the sonic-vibrator put them to sleep without trouble. Zenda slept alone, lying like a child, with her honey-brown hair tumbled over her shoulders. Thaldrek made sure, with the little box at his waist, that she slept soundly.

They retrieved the weapons Zenda had taken from them, and Shane turned to go. Thaldrek stopped him with a whispered, "Wait!"

"We have what we came for," Shane snapped.

Thaldrek shook his head impatiently. "You're taller. Reach me that lock box from the shelf."

Shane hesitated. "You want to find Ptakuth, don't you?" demanded Thaldrek. Shane shrugged and lifted down the heavy box, muscles coiling along the one naked arm he deigned to use.

The lock was tight. Thaldrek turned to Zenda, lifting back the curtain of her hair with strangely gentle fingers. There was a twisted thong about her neck. The Martian loosed it, grasping the key that hung from it.

The opened box yielded a metal-leaf notebook, written close with acid-etched lines. Thaldrek opened it, taut with suppressed eagerness. "Harold Challoner's diary," he murmured. "The secret of Ptakuth!"

SHANE'S patience had reached the snapping point. Distrust of Thaldrek, perplexity over his reason for aiding his, Shane's, escape when he might have gone alone, dislike of the uninvited trespassing in Zenda Challoner's boudoir, combined to set an ugly temper rising in him.

Thaldrek's low voice stopped his half-defined impulse toward violence. Almost as though, he were

thinking aloud, the Martian stared at the notebook and spoke.

"He found the city, and the treasure. His three friends died there, realizing too late. When he understood his own condition he destroyed the entrance to the cliff city of Ptakuth and came here. Of course! Zenda has the only key."

"Zenda?" Shane was very close to him, his face hard.

Thaldrek met Shane's gaze. "The girl goes with us, Shane. She's the only one who can find Ptakuth for us. There's a hidden way that Challoner left, not quite daring to hide the treasure completely from the world. You only want the city; you're welcome to it. But I want the treasure!"

There was eager laughter under his words. "Ptakuth was cursed and destroyed because of that treasure, Shane. Challoner became a god because of it—and killed himself ten years ago. But there's a place for that treasure in the world, Shane, and I want it!"

Shane sensed danger very close. His gun was half out of its holster, but Thaldrek's hand was quicker on the dial. The tall man's eyes glazed, his face went slack, and he slid the gun back.

Thaldrek smiled and shook his head. "I don't know why I bother with you, Terence Shane, except that I had a hunch it would be like this. My sources of information are better than yours. The Shunni are going to be annoyed when they find their goddess gone—and being torn to pieces is such a messy death."

Tucking the notebook in his belt-pouch, Thaldrek turned to his prisoners. "Walk ahead of me, to the valley entrance. Zenda, you will handle anyone who gets in our way. I'll fix the guards."

A quarter of an hour later they

were far beyond the valley, leaving half a dozen Shunni sleeping peacefully at their posts. Thaldrek spoke briefly but earnestly with Zenda, listening intently to her mechanical answers. When another half-hour of brisk walking across the barren, tumbled rocks was past, Thaldrek halted his strange little cavalcade.

A narrow cleft was driven into a low cliff nearby. Shane, obeying like an automaton, walked into it and lay down, falling instantly into a deep sleep.

"For three hours," ordered Thaldrek. "That's about the best I can do for you. The Shunni will be coming along here eventually; that should give them time to get past you. They won't see you, you have your gun, and you can suit yourself from there on." He grinned. "You should be duly grateful, but I suppose you'll only swear."

Thaldrek sealed the end of the cleft with a boulder, thinking over his plan. "It's cut rather fine, but I don't see why it won't work. The Shunni will be between me and Shane. I should be through and away before they get to Ptakuth, but in case they trap me there—they won't come in after me because the place is taboo—I've got Zenda to get me out. And I'll give the bomb plenty of time."

He turned to Zenda, still quiescent under the spell of the sonic hypnotism, and there was something sad and wistful in his long gray eyes as he looked at her.

"Take me to the secret entrance of Ptakuth, Zenda," he said quietly, and sighed.

SHANE WOKE abruptly to the fading scuff of many sandaled feet and a muffled clank of weapons. Springing up, dazed and angry with half-remembered things, he climbed the

concealing boulder in time to see the last of a band of Shunni warriors vanish into a tangle of naked tors. Phobos was low in the east, Dicmos rising slowly over it to cast a jumble of conflicting shadows.

A word came to Terry Shane's lips, and the word was "Zenda!" Thaldrek had taken her, to find the hidden way to Ptakuth and the treasure. What would he do, or had he done, to her afterward?

He could guess where the Shunni were going. Thaldrek and the girl must have left a trail that these hillmen could follow in the dark, and they wanted their goddess back.

Half wonderingly, Shane found his gun safe in his holster. Like a black bull he took the trail of the Shunni.

He had no notion of time. But suddenly, as he topped what had been in distant ages a wooded peak overlooking the river, he saw his goal. To his left the river widened to a great inland harbor; there were crumbling stone quays still jutting into dry red sand, but the cliffs behind them had fallen in ruin. Man-made ruin.

"Challoner destroyed the entrance," grunted Shane. "And that must be the one he left!"

Five hundred Shunni warriors squatted in a grim semicircle about a crack in a cliff some fifty yards

to his right. Thaldrek and the girl were still in there, then. Shane nodded. Then a sudden icy question flashed in his brain. "What's taking him so long?"

There was just one way to get into that crack—from the top. The guarding Shunni would kill him in sheer rage if they caught him. Driven by haste that had something strange and disquieting in it, Shane skirted the cliff, climbed its wind-pitted surface at a safe distance, wormed his way silently back, and lowered himself into the narrow crack.

A man of lesser strength would have fallen. Shane, knees and elbows scraped raw, fingers bleeding, drenched with sweat, came safely to the bottom and turned down the low tunnel that opened into the heart of the cliff, drawing an atomic torch from his belt pouch.

The white beam showed him mighty buildings hewn out of the living rock, rearing up to hold the stony sky; great shadowy doorways and the marks of countless sandals in the stone floor underfoot. On all sides, branching away in every direction, were high-arched corridors broad as city streets, spanned at many levels by metal bridges. Shane stopped, uncertain.

From somewhere, thinned by dis-



tance and the winding of the maze-like galleries, came a voice, calling.

"Thaldrek!" grated Shane and started off, guided by that voice that called and called. The rocky walls picked up his footsteps, threw them from side to side, hurled them back at him from metal doorways.

New footsteps echoed abruptly, coming nearer. Around a carven corner came Thaldrek, his hawk face strained with a deadly urgency, and he was calling, "Zenda! Zenda Challoner!"

Torches made crazy patterns on the carven walls as Shane caught the running Martian by the shoulders, shook him savagely.

"Where is Zenda?"

"Lost," said Thaldrek, in a flat, quiet voice. "Lost in the dark in these corridors. And unless I find her and get us out of here within twenty minutes, we'll both die. You, too, Shane, since you somehow blundered in here."

"I didn't blunder," said Shane grimly. "And why will you die in twenty minutes?"

"I set the bomb forty minutes ago, to destroy the cyclotron. When I went back for Zenda, she was gone. It was my fault; in my excitement I forgot to give her a time command, and as soon as the sonic beam was off her, she regained consciousness. She ran away, of course, and I've been hunting her ever since."

There was much that Shane didn't understand, but there was just one thing now that mattered.

"Can I get to the bomb in time to disconnect it?" he asked, and Thaldrek's eyes widened slowly at the tone of his voice.

"You think I'm afraid to go back, don't you?" Thaldrek laughed suddenly. "And I am. Not of dying—but of living!"

His eyes fastened on Shane's.

"Yes, you can get there. Perhaps you can disconnect it in three minutes, though I don't see how. But if you stay more than three minutes under the ray, you'll get what Challoner got. *Immortality!*"

"I've already stayed the limit, making calculations and setting the bomb. And I don't want immortality at the price Ptakuth paid!"

Shane shook his head. "I don't understand. But I'll disconnect that bomb if— Wait!" His hand caught the neck of Thaldrek's tunic in a strangling grip. "What are you trying to pull? If the bomb goes off, it'll only destroy the cyclotron."

"Look." Thaldrek kicked the nearby wall, looked at Shane as a trickle of dust cascaded to the floor. "Mars is old. The water is gone from these rocks, the iron rusted out. The shock of that atomic bomb in the heart of the city will bring Ptakuth down in fragments."

Shane let him go. "Where is the bomb?"

Thaldrek turned. "This way. And hurry!"

RINGING, shadowy corridors reeled behind them. And abruptly Thaldrek snapped off his torch. "The treasure of Ptakuth, Shane."

Light filtered into the darkness, growing as they approached its source. A massive archway opened, and beyond it was a square, spreading away in majestic simplicity to a raised platform. On the platform, under banked generators and transformer tubes, hemmed in by screens of unfamiliar metal, towered a great machine; a vacuum tube standing between poles of an electro-magnet that must have generated twenty million volts. There was a sort of shimmering all through the square, as though there were colored light just beyond seeing range.

"It draws power from the heart of Mars itself," murmured Thaldrek. "A power that has never weakened." He stiffened suddenly. "Zenda!"

Walking slowly through the shimmer, her bronzed slimness undulant, her arms raised as though in adoration, Zenda Challoner came from around the circular platform. Shane gasped. He had not remembered she was so beautiful. She was transfigured, filled with a joyous vitality as a glass is filled with wine.

"Zenda!" shouted Thaldrek, and there was tragedy in his voice. The girl paid no attention. Thaldrek caught Shane's arm in a grip that made him wince. "Get her, Shane! Get her, before it's too late! Unless it is already—"

Shane didn't understand, but he caught the deadly terror in Thaldrek's voice. Terror not for himself, but for Zenda. Shane started forward, into the square. There was a mild electric shock, a surging in his blood as though all the life processes were being speeded up. He could understand Zenda's worship of the strange force.

"The bomb!" he said, stopping suddenly. "What about the bomb, Thaldrek?"

The Martian groaned. "Get Zenda! Never mind—oh, my God! There won't be time afterward. Five minutes left. And you'll have used at least half of your three minutes of safety!"

Terry Shane swore. "What is this talk of 'three minutes'?"

"The limit of safety under the ray. At three minutes the radiations make a definite impression on the body. At five you have immortality. At six, death!"

"Get Zenda before you're both lost!"

Shane turned and ran toward the girl. The ray was like strong sun-

shine on him; he felt vitalized and invincible, afraid of nothing. Thaldrek was a quivering coward—

Harold Challoner stayed too long under the ray. He killed himself. He was The-One-Who-Never-Sleeps.

Something strange and cold caught Shane by the throat. Blood beat in his ears, his heart thundered, his knees bent under him. Ptakuth was cursed and lost, Challoner died by his own hand, and he, Terry Shane, was soaking in the same ray that caused it all.

He stopped, and a strange, incredulous look came over his face. "Faith," he whispered. "Faith, and I'm afraid!"

Thaldrek's voice spurred him. "Hurry, Shane, hurry!"

The Irishman shook his head to clear it. Zenda Challoner wavered in the misty radiance, utterly uncaring. Shane felt a surge of pity rise in him; pity, and something else. He grinned crookedly as he broke into a desperate run.

"And," he muttered, "I'm thinking I'm in love also!"

The girl was warm and light in his arms. He shielded her with his body, not knowing that the rays went through him unchecked. And, while he ran with all the strength that was in him, he kissed the soft hollow of her throat where it lay under his lips.

"Three minutes left," said Thaldrek tightly as he caught the girl from Shane. "And only a minute and a half left for you, if you go back."

"Can a man be in love and afraid at the same time?" wondered Shane, and turned back into the shimmering square.

ACROSS the sandal-hollowed stones, running like a deer with the new power that was in him from the ray.

Up the steps of the circular dais, searching, searching. Then he saw it, a little globe like a big marble, with a timing device set clockwise atop it in a strong metal case.

Shane had seen bombs like that before. Once they were set there was no stopping them, unless one had time and the proper tiny tools. And again fear gripped Terry Shane as he thought of the seconds ticking away, felt the ray beating its wonderful, horrible strength into him, thought of those artificially unstabilized atoms ready to blow Ptakuth and everyone in it to powder. Fear, and a humble realization that there were bigger things in the world than Terence Shane.

There was just one thing he could try. Kneeling, he caught the timing device between thumb and forefinger, set the thumb and forefinger of his other hand over those. And he pressed.

Veins swelled in his forehead, his face drew into a tight mask of agonized effort. The thing was so tiny, his strength baffled by its very smallness. He lost track of time, of everything except that stubborn bit of metal between his fingers. Perhaps he was already a "god" like Challoner. Perhaps the bomb would go off in his hand. Perhaps there was no use of anything, because Zenda was already cursed with the curse of Ptakuth.

Blood spurted from his fingertips as the flesh split under the pressure. One more effort, and he must stop.

Like a sweating colossus he poured every last ounce of his strength into his crushing fingers. And the metal gave, bent inward, split away with a tiny jangle of ruptured instruments.

Shane sagged, his cramped hands cushioning the fall of the bomb. He would have lain there and slept, but that a voice kept shouting his name. "Thirty seconds, Shane. Run!"

AST—6

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Blindly he rose and ran across the wide and empty square, hardly knowing it when he was safe in the corridor, not knowing it at all when ultra-sonic waves blanked what was left of his conscious mind, set him walking toward the entrance where the Shunni sat.

He came to with his head pillowed in Zenda's lap. They were atop the hill from which he had first seen Ptakuth, and where the cliffs had risen beside the dead sea, there was now only a vast rubble-choked hollow. Ptakuth was gone, the treasure with it.

Shane struggled up, questions pouring to his lips. A change came suddenly over Zenda; her eyes glazed, and when she spoke it was not with her voice.

"This is post-hypnotic command, Shane," she said. "Don't worry, Zenda is quite safe. Her body displays none of the symptoms of immortality; she had probably been there only a minute or so.

"I went back, after Zenda got us through and sent her warriors away, and set another bomb near the entrance. The secret of the cyclotron is too big and dangerous, I realize now, to loose upon the world, no matter how much money it might bring me. That's my business, as you know; selling secrets to the highest bidder. I set the first bomb, of course, to avoid any competition. The second was to destroy all my notes as well as the 'treasure' itself.

"This much I can say, Shane; tell it to the men of the Martian Foundation, and let them make what good they can of it. The cyclotron fired hydrogen bullets against a screen of yttrium. Using rubidium filters, the scientists of Ptakuth generated a ray with a wonderful property; the property of making the human bloodstream radio-active with a gamma-

principle. This gamma element in the blood gave a power of regeneration to the body cells, but most of all, being in itself a germ-destroying element, it made the human body immune to all disease. You can see how this would extend the life span.

"The tragedy was that the ray destroyed whatever mysterious center of the brain it is that controls sleep. Imagine, Shane; a lifetime of several centuries, with never a moment's relaxation in sleep, never a quiet time of darkness and rest. Every second of every day lived to the uttermost. Ptakuth went mad! Like Challoner, it destroyed itself, and the rest of the world said it was cursed. Ptakuth was shunned.

"Yet there may still be good in the secret. Let modern scientists build what they can from the scraps of knowledge you have; they may find a safer way.

"We may meet again somewhere. If we do, remember that I know your secret. You were afraid twice on the same night!

"Good-by, and good luck to you and Zenda. May your daughters be as lovely, your sons as brave!"

Abruptly, as though it had never been, the post-hypnosis was gone. Zenda smiled, half shyly. Shane stretched out his arms, cradled her face between hands bandaged with strips of her blue skirt. "Thaldrak told me what you did," whispered Zenda. "At least I know."

Miles away on the other side of the dry river, a small spaceship roared up and drew a streak of vanishing flame against the paling sky. Shane looked after it with an odd little grin. Then he bent toward Zenda.

He stopped, chuckling. "Faith, girl," he murmured, "I'm afraid again!"

But not for long.

THE MAGIC BULLET

By Willy Ley

A magic bullet that goes hunting for a target to strike would be wonderful in war. There is one—but like most magic, it's highly unreliable, and not half as deadly as it's made out!

It all began—or so most people believe—on that early afternoon of April 22, 1915, on the Western Front when the troops in the trenches of the Allies suddenly saw clouds of a greenish gas coming toward them from the German lines. Before the soldiers quite realized what was happening they found themselves choking and terrorized, unable to hold their posts, unable to fight, unable even to think. The troops of the Allies in that sector were Canadians and French Turcos. The latter abandoned their positions and fled screaming; the Canadians, after getting over the initial surprise, managed to offer a semblance of resistance to the German troops that followed closely behind the clouds of poison gas. They broke through the Allied lines on a four-mile front. It has often been pointed out by experts on both sides that the Germans could have gained much more if they had taken proper advantage of the situation.

It was chlorine gas that was released on that day, 168 tons of it from 5,730 steel cylinders that had been brought into position in the first-line trenches of the Germans. An additional 330 tons were discharged during the next four weeks. The number of casualties resulting from these attacks was about 9,000 with 2,000 dead.

Thus "Poison Gas Warfare" as most people, or "Chemical Warfare" as army experts call it, started during the World War. The subsequent development left no doubt that chemical warfare had come to stay, and when the World War finally came to a conclusion very many people—especially those that had only heard of poison gas—were convinced that chemical weapons would be used almost exclusively in any "next war." A whole library of books and pamphlets was written and published about "gas" and gas attacks during the years from 1919 till about 1926.

It was an appalling amount of trash, originating notably in Great Britain and in Germany, but being by no means confined to these two countries. The authors of these books and pamphlets—often thinly disguised as novels but usually taking the shape of straight prophecies—delighted in picturing future war or class war—whatever suited their personal political beliefs better—as "poison gas wars." It was entirely evident that these wars were wars not only without victors, but also without survivors. The "plot" of those horror pictures was that one night noiseless airplanes would silently appear over the principal cities of the enemy and start raining the "Dew of Death" upon unaware

and sleeping soldiers and civilians. The gas would sink down, kill everything alive in the buildings within a second or two and then linger in the dead cities for years, nay, decades and centuries to come.

As long as such stories were confined to novels nobody cared very much. But when the theme began to penetrate into serious-sounding articles in the Sunday supplements of newspapers and the cheaper magazines, things began to assume serious proportions. There were a good many people on the verge of hysteria and even those who were more calm firmly believed what they read in print. They believed that the "new and secret" war gases were five hundred times as deadly as mustard gas—"which killed what it touched, men, animals and trees." It was written and believed in dead earnest that "two commercial airliners, converted for war use, could completely destroy a city like London in less than fifteen minutes."

About fifteen years ago, Germans believed that American scientists had found "more than a thousand different new kinds of poison gas, each at least fifty times as bad as Lewisite." French periodicals printed articles that the Japanese possessed a gas that not only killed immediately, but also corroded the bodies of the victims so quickly that about five hours after the attack there were literally no corpses left. The English were ready to bet their entire fleet that the Germans had such a gas. And at the same time German newspapers learned that a French professor had dedicated to his government a new poison so powerful that one ounce of it would kill a quarter of a million people.

Even an author of the rank of H. G. Wells succumbed to the general poison-gas hysteria and wrote

in his "The Shape of Things to Come" about mustard gas: "Steadily but surely it killed every living substance with which it came into contact—it is doubtful if any of those affected by it were ever completely cured;" and about Lewisite: "One part of it in ten millions of air was sufficient to put a man out of action. It was inodorous, tasteless." And, it might be added, these statements contained only a grain of truth.

The terror of poison gas was evidenced to those authors by the fact that one ton of Lewisite can kill forty-five million people—provided they stand in line and permit a well-measured droplet of it to be put into their mouths. One author "misunderstood" the term "one ton" which is about 1,000 kilograms, and substituted 1,000 grams, or 2.2 pounds, with the result that "one soldier could carry the amount needed to poison all of Europe." Statistics proving that during the last years of the World War about eight tons of

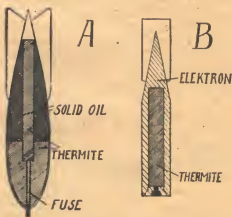


Fig. 1. Modern incendiary bombs: A. American; B. German. These are the real peril to modern cities, for they need not supply the destructive chemicals; the wood of the buildings and the air do the damage—the bombs need only start it.

mustard gas accounted for *one* dead enemy were available even then, but nobody bothered to look them up. The evil will of the "war lords" was proven to a German Communist by the recommendation of basement shelters in case of air raids, a recommendation made "bearing in mind that poison gas is heavier than air so that it will surely reach the workers crowded in basements and subways."

That the scientists who devised such horrors were completely unable to find adequate means of protection was taken for granted. And if somebody dared to mention that a high-explosive shell is also very unpleasant, he was shouted down from all sides with the argument that the Treaty of Versailles prevented Germany from manufacturing poison gas. Which proved that it was the worst since there was no ban on dynamite or TNT.

In retrospect one can find various reasons for that hysteria. One was the paragraph in the Versailles Treaty which made "gas" look tremendously dangerous. Another was outright propaganda in wartime, saying: "They don't fight your sons and brothers honestly, they poison them." The third, and psychologically most important, was a mistaken notion about the novelty of poison gas. People compared it with mechanical inventions and said, in effect: "If chemists could concoct a devil's brew like mustard gas in a hurry in wartime, what will they be able to find with leisure and with the unlimited resources of peace time."

As a matter of fact chemical warfare was not new in the World War. One may argue whether the "stink pots" of Chinese pirates and the earthenware vessels with living ven-

omous snakes used by the Egyptians in ancient sea battles are to be regarded as chemical weapons. But there were actual "cloud attacks" in antiquity. The writer Thukidides reported that "sulphur fumes" (SO₂) had been released against Delion in 424 B.C. and that the attacking Peleponnesians had captured the city with its aid. A similar attack on Platea, made in 428 B.C., had failed due to sudden rain.

The smoke of green wood and of wet leaves—a quite effective form of tear gas—had been used time and again in the following centuries to drive hidden or fortified enemies from the places they occupied. As early as 1650 the commander-in-chief of the Polish army, Colonel general Kasimir Siemienowicz even evolved a philosophy of chemical warfare. He related that in his time it was a custom that "all those who wished to practice the art of pyrotechny were required to swear an oath that they would never manufacture any globes containing poison—and never make use of such for the slaughter of men." But, he continued: "It is nevertheless quite right and reasonable and proper for the most pious Christians among us to use these projectiles, not, indeed, against other Christians, but against Turks, Tartars and other infidels." And as far as smoke was concerned there were no scruples at all, it could be "employed more freely seeing that it merely irritates and causes annoyance to the enemy."

It is really strange that poison gas had to wait till 1915 to be used, it was suggested often enough. Lord Cochrane proposed the use of SO₂ against the French in 1809 and against the Americans in 1814. It is reported that the Duke of Wellington opposed the suggestion with the words: "Two can play at that

game." But it is also reported that the English did use SO_2 in 1854 in the Crimean War. Aroused by that example the French conducted some secret experiments with poison gas, but soon gave up again. But if the idea of chemical warfare had not been under consideration in military circles it is hard to understand why the conference at The Hague in 1907 should have taken the trouble to agree on a ban. That ban was renewed, by the way, after the World War in another agreement signed about 1925 at Geneva. Such an agreement, nicely worded as it may be, does not, of course, eliminate chemical warfare. It has already been broken several times, one of the instances being the Italian war in Ethiopia.

Whether chemical weapons will be used in the present—and, so far, very curious—war and in future wars will be decided on purely military grounds. That the question is anything but simple is proven by the fact that there exists two diametrically opposed opinions. One is the picture drawn in all those "horror stories" and in "Things to Come." The other is the opinion of some military experts that poison gas is nothing but a handicap in a successful war, an opinion that has meanwhile found some justification in the *Blitzkrieg* in Poland.

To judge impartially which opinion might be right, it is necessary to become acquainted with all the facts pertaining to World War use of chemical weapons. It started with that cloud attack already mentioned. Professor Fritz Haber, the man responsible for it, had had a hard time to convince military authorities. Since he was a civilian and a Jew, they had almost refused to listen to his suggestions at all. Then he had spent months in the

front-line trenches to gather first-hand information about conditions. While shaping up his plans, he may have thought of one of the German operas, Karl Maria von Weber's "Der Freischütz." In that opera the forest demon Samiel assists in casting magic bullets, bullets that will hit accurately if fired only in the general direction of the target. That really sounds like a somewhat nebulous forecast of chemical weapons. Physical weapons, sword and ax, arrow and gun, need careful and very accurate aiming so that they may wreak havoc by blow and impact. But chemical "bullets" do not need accurate aim, they seek and find the vital spots alone. Also, as "predicted" in the opera, only a few of the magic bullets hit where the marksman wants them to strike. Then if one strikes where Samiel wants it to hit, it might turn back against the hunter.

THE ALLIES did not just don "armors" against the magic bullets of the Germans. Their factories made gas masks in quantities, but they also made gas. Only a few months after the first cloud attack, the chemical war started in earnest. Phosgene followed next, a gas eleven times as powerful as chlorine. The masks, however, if fitted properly, fully protected their wearers. The active agent in the "filter" of a gas mask is activated charcoal which absorbs the molecules of poisonous gases with only a few exceptions—which will be discussed later on. But activated charcoal does not stop particles of dust. Thus the next group of war gases was introduced, and they were not gases any more. It is mainly an accident that the first two agents of chemical warfare that were used extensively, chlorine and phosgene were actually gases.

Practically all of the others that were introduced later were not gases, so that the word "gas"—which was retained—acquired a different meaning in military parlance, as it would if used by a physicist. Mustard gas, for example, is a liquid, while others are solids.

In the beginning of chemical warfare, the chemical nature of the gases used was needlessly treated with much secrecy. For that reason, and also to save the soldiers the trouble of memorizing and using long chemical terms, the German commanders invented the method of painting colored crosses on the shells and containers. Chlorine and phosgene had green crosses; they were and are therefore referred to as "green cross gases." Mustard gas had a yellow cross, the paint used contained a few ingredients to make it discolor if it was touched by the mustard gas liquid, so that leaking shells could be recognized at a glance. The solid substances that were introduced together with mustard gas were marked by blue crosses; they passed through the ordinary gas masks and caused violent sneezing and coughing, so that the soldiers had to remove their masks and fall prey to the other gases that were used together with "Blue Cross."

Classification of the various war chemicals was pretty erratic during the World War, but afterward a certain system was generally adopted. There are, according to American classification that is in use in most countries:

1. Lung Irritants (Suffocants) like Chlorine, Phosgene and Chlorpicrin.

2. Irritants or Sternutators (Sneezers) like Diphenylchlorarsine, Diphenylaminechlorarsine and Diphenylcyanarsine.

3. Lachrymators (Tear Gases)

like Bromacetone and Chloracetophenone.

4. Vesicants (Blisterers) like Mustard Gas and Lewisite.

The designations of the German and a number of other armies for these four groups are, in the same order, Green Cross, Blue Cross, White Cross and Yellow Cross. The American army does not use the same markings, the American mustard gas shell, for example, shows two green bands.

What these "gases" do is clearly indicated by their names; it might be added that a normal gas mask protects against groups 1 and 3, while group 2 required an additional filter, and group 4 protective clothing.

ALL THIS, I hear the readers muttering, is very nice, but what about the war chemicals invented *after* the World War? Well, although only the war offices of the various countries could answer that question with certainty, it can be stated with a degree of probability that is practically a certainty that there are none. Even during the World War the "invention" of poison gases consisted only in finding methods of application, like cloud attacks, shells and bombs. In manufacturing the gases or liquids in quantities and in *selecting suitable chemicals*, most of the substances used during the World War were known for a long time. Chlorine was known to chemical science since 1774 (discovered by Scheele); phosgene was known since 1811 (discovered by Davy); chloropicrin had been discovered in 1848 by the Englishman, Stenhouse; diphenylchlorarsine (Blue Cross) had been made by Michaelis in 1881, and mustard gas around 1855 by Nieman, while all its toxic effects had been described accurately and in detail in 1886 by Viktor Meyer!

Hardly any of the War gases of the World War were new, and the three that were best, phosgene, mustard gas and diphenylchlorarsine were known for half a century at least. Which implies that there will not be any important surprises in the future. Chemists, that know their poisons and the changes in molecular structure that increase toxicity, are almost ready to deny any kind of surprise. It is true that any poisonous substance, liquid or solid, will do if suitable in other respects. But the majority of all poisonous compounds can be rejected without even a laboratory test. The number of those that underwent closer examination was approximately one thousand. More than nine hundred of them were found un-

suitable for reasons like lack of raw materials, tedious manufacturing, or similar things.

It might be worth while to quote a few examples of such unsuitable poisons. There is one that has all the features of a terrible war gas. It is an extremely potent irritant of all mucous membranes, it attacks all types of tissue without exception in the worst manner. Masks are of little use and the so-called "lethal concentration" is slight. It is the oxide of a metal which can be produced by simply burning the metal in air or dropping pieces of it in *Aqua regis*. The metal itself can be handled like so much brass. But the metal is: *Osmium*. Which makes the "gas" osmium tetroxide (OsO_4) and unlikely of ever being used.

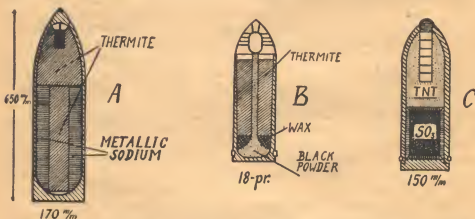


Fig. 2. Incendiary and smoke shells. A., German 170 mm. "minenwerfer" (mine-thrower) incendiary shell containing mixed sodium and thermite charge. Both thermite and metallic sodium burn inextinguishably—but metallic sodium, in burning, has an added unpleasantness. The "ash" produced in its combustion is sodium peroxide—and sodium peroxide is so powerful an oxidizing agent that, if it falls on a wooden roof, floor, et cetera, the organic matter will burst into flame. Practically speaking, the stuff burns not once, but twice.

B. British 18-pr. field artillery incendiary shell, using straight thermite. Difficulty with metallic sodium is that, while very effective as an incendiary agent, it's reliable as a tame tiger with dyspepsia. It oxidizes on the slightest provocation, is not pleasant to pour into shells, and starts trouble at the touch of dampness from a loose shell-nose. Thermite, on the other hand, suffers only from the fact that it's hard to start. Otherwise it's safe, reliable, easily handled and cheap.

C. Smoke shell for German powitzer. The sulphur trioxide makes a dense "smoke" by condensing water out of the air, and forms sulphuric acid, which is not good for man or beast or gun, for that matter. It suffers from a mad appetite for water, and is as unpleasant to work with as metallic sodium. It doesn't flame, but it corrodes, which metallic sodium doesn't do.

One of the worst gases known—it really is a gas—is CO, carbon monoxide. It is very poisonous, invisible, completely odorless and passes the filters of all ordinary masks as if they were so much wire mesh, and can be made on the spot in cheap, simple apparatus. But it is lighter than air. ¹⁾

Another gas of a very bad reputation is hydrocyanic acid or prussic acid. It is not odorless—everybody knows the smell of bitter almonds—but it kills very quickly. This is the reason for its bad reputation. Its toxicity is actually only about one third of that of phosgene. Although not generally known, prussic acid already passed a field test and lost. During the battle of the Somme, which began July 1, 1916, the French fired more than 4,000,000 shells containing prussic acid and arsenic trichloride—also of bad reputation—against the Germans. Unless the shells accidentally hit individual soldiers directly, they did no harm. Although they carried 4,000 tons of the two dreaded gases to the German lines, nobody was poisoned. It was impossible to achieve lethal concentrations of those gases in the open. Experiments under so-called field conditions had worked nicely on French proving grounds, but there the victims had been dogs, and men proved to be much harder to kill.

Small wonder that of the thousand poisonous compounds that had looked promising only thirty-eight were finally used in the field. And of these not even ten did what they were expected to do.

THE LIST of demands a war gas has to meet is really quite long and severe. It should be invisible and

odorless, quick acting and of high toxicity; it should have multiple effectiveness—acting against lungs and skin, et cetera—high penetrability—of masks and protective clothing—it must be heavier than air; it should be chemically stable and not decompose if stored for a long time. Furthermore, it must withstand the shock of explosions, and should not change in the presence of moisture. Insidiousness is also desirable, and then it should be persistent or not, depending on where and how it is being used. The casualty effect must be of long duration; that is to say that gassed soldiers should recover slowly but, if possible, without permanent injuries. To these military demands, the economic demands have to be added, which say that the gas should be easy to manufacture on a large scale and from cheap and available raw materials. Furthermore, it should be easy to handle during manufacturing. Finally, there are a few special wishes as to melting and boiling points.

Of all the poisonous substances known, only two approach this ideal closely, phosgene and mustard gas. The weak points of phosgene are that it is not odorless, acts only on the lungs, that it decomposes quickly with water and that it forms visible mists in moist air. Mustard gas avoids most of these weak points. If pure it is practically odorless—but it is hardly ever pure. It decomposes very slowly with water, but it does not disable the soldier immediately, and is not easy to manufacture. Lewisite is about 20 percent more toxic than mustard gas, but it has a rather strong odor which makes detection easy—attention, Mr. Wells. It is not as persistent and not as stable as mustard gas—explosions are likely during its

¹⁾ There are a few cases of CO poisoning during the war on record, but they were accidental. The gas had been generated by incomplete combustion of the high explosives in artillery shells.

manufacture—and although its irritating effect on the skin is felt at once, it also does not disable the enemy immediately. All the other war gases are definitely inferior to phosgene, mustard gas and Lewisite, so that experts feel that only these three—probably in coincident application with one or two of the sternutators—will play a rôle in future warfare.

The reason for this is that they, as a rule, do *not* kill. That may sound surprising, but it is nevertheless a fact, even though tens of thousands of soldiers during the World War were killed by just these two gases. Even military men do not always find the right attitude as is shown by a case in point I am quoting from Professor J. B. S. Haldane's—he is at Cambridge University—"Callinicus."

In 1915 a British chemist proposed to a general who was concerned with such questions that the British should use dichloroethyl sulphide (mustard gas). "Does it kill?" asked the general. "No," he was told, "but it will disable enormous numbers of the enemy temporarily." "That is no good to us," said the man of blood; "we want something that will kill." It is interesting to find how completely the ideas of this worthy soldier coincided with those of the average intelligent child of five years old. I may remind you that Clausewitz held the view that the object of war was to impose one's will upon the enemy.

And that is done better by not killing. A killed soldier is just written off the books, but a wounded soldier who needs many weeks to recover, is a definite burden. It is more harmful to the enemy to wound three divisions than to kill one.

Mustard gas is ideal for doing that, as is evidenced by the following description of the "History of a typically severe and totally unprotected case," quoted from the British "Manual of Treatment of Gas

Casualties," issued by the War Office in 1930.

On exposure to the vapor, or even on contamination by the liquid, no signs or symptoms are experienced immediately. The only clue to contamination may be by detecting the faint, though characteristic odor, or by actually seeing the liquid or a stain. It must be repeated, there is no pain or other sensation in the early stages. After the lapse of two hours or longer, signs of injury may appear, without as yet any subjective phenomena, followed later by symptoms which subsequently develop with some rapidity.

The eyes are the first to show any signs of irritant action. They begin to smart and water. The nose about this time commences to run with thin mucous, as from a severe cold in the head and sneezing is frequent. Nausea, retching and vomiting associated with epigastric pain begin about the same time as the pain in the eyes and recur at frequent intervals for several hours.

During the next few hours the conjunctivitis increases in intensity and the vessels are deeply injected. The throat feels dry and burning, the voice becomes hoarse and a dry, harsh cough develops. Inflammation of the skin now shows itself in a dusky red erythema—should any part of the clothing have been actually splashed by the liquid or have been contaminated with impregnated earth the underlying skin will be profoundly inflamed. During the stage of inflammation the patient may suffer from the most intense itching which interferes with rest and sleep and is most wearing. The injury to the skin may amount to a mild degree of inflammation and cease at that, but where the effect of the poison is more serious small vesicles may appear which quickly coalesce to form large blisters in the same area.

At the end of twenty-four hours a typical appearance is presented. The main distress is caused by the pain in the eyes, which may be very great. The patient is unable to see on account of the inflammation and edema of the conjunctive of the eyelids. Tears ooze between bulging edematous eyelids over his reddened and slightly blistered face, while there is a constant nasal discharge and an occasional harsh, hoarse cough. The respiration is fairly normal both in rate and depth. There may be a frontal headache associated with pain in the eyes. Death practically never occurs during the first twenty-

four hours. During the second day the condition is aggravated by the development of the vesicles into large blisters where the inflammation is obviously severe. Death may occur at any date from the second or third day to the third or fourth week in the more lingering cases, the highest death rate occurring at the end of the third or fourth day after exposure. The death rate with well-disciplined and well-protected troops is low, about two percent of the cases since the gas mask will protect the respiratory tract.

As this medical treatise shows mustard gas burns bear much similarity to heat burns, but they differ from heat burns in so far as the whole case develops much more slowly, the inflammations are much more severe, they heal much slower and the tendency to septic infections is greater. The results of Lewisite are very much the same, but the skin is irritated at once and everything, including the healing process, takes much less time.

A MILD CASE of mustard gas poisoning acts and feels very much like poison ivy poisoning, and, just as there are people immune to poison ivy, there are also people almost immune to mustard gas, i. e. as far as the skin reactions are concerned—breathing it is another matter. It is not very surprising to learn that the number of immune Negroes is four times as high as that of immune whites. Chloride of lime is the antidote; it is used in the form of powder to destroy the liquid where it settled down, and in the form of a watery paste to treat the skin before it forms blisters. The water is only a cooling agent, since mustard gas reacts with chloride of lime developing heat. There exist also protective pastes that can be applied to the skin prior to possible contamination. 1)

1) Mustard gas can be washed off with gasoline and similar liquids, but that only removes and does not destroy the poison.

Before passing on to the future of mustard gas, it is necessary to learn about the properties of the other important war gas, phosgene.

The (British) "Official History of the War" (Vol. II, London, 1923) contains a very typical case.

February 3, 1917: A chemist was working at a new chemical product. A syphon of phosgene, required for the synthesis of the substance, burst on his table at 1:00 p. m. A yellowish cloud was seen by a second person in the room to go up close to the chemist's face, who exclaimed "I am gassed," and both hurried out of the room. Outside, the patient sat down on a chair, looking pale and coughing slightly.

2:30 p. m. In bed at hospital, to which he had been taken in car, having been kept at rest since the accident. Hardly coughing at all; pulse normal. No distress or anxiety and talking freely to friends for over an hour. During this time he was so well that the medical officer was not even asked to see the patient upon admission to the hospital.

5:30 p. m. Coughing, with frothy expectoration, commenced and the patient was noticed to become bluish about the lips. His condition now rapidly deteriorated. Every fit of coughing brought up large quantities of clear, yellowish, frothy fluid, of which eighty ounces were expectorated in one and a half hours. His face became a gray ashen color, never purple, though the pulse remained fairly strong. He died at 6:50 p. m. without any great struggle for breath. The symptoms of irritation were very slight at the onset; there was then a delay of at least four hours, and the final development of serious oedema up to death took little more than an hour, though the patient was continually rested in bed.

This, of course, portrays a very severe case, but it is typical for all phosgene poisonings. The victim at first hardly knows he was gassed and gets better for a while, even if symptoms are noticeable. Death, in the case of phosgene poisoning, occurs, as a rule, within the first twenty-four hours, and if the patient survives two days, it is practically certain that he will recover. Chemi-

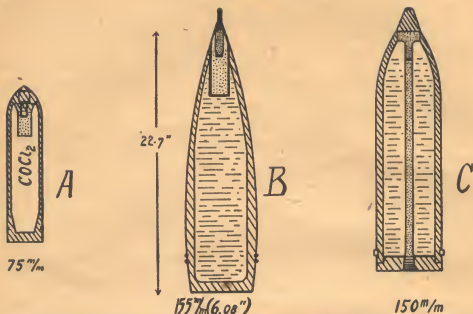
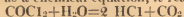


Fig. 3. A French 75-mm. gas shell—first of the modern type. All previous shells had been combination gas and explosive shells. For the first time, with this shell, a bursting charge only enough to open the case was used.

B. Modern American 155-mm. shell.

C. Modern German 150-mm. gas shell.

cally, the action of phosgene—this name, in translation, means “created by light,” and was given by its discoverer, Davy, because he made it by the action of sunlight upon a mixture of carbon monoxide and chlorine—is extremely simple. Written as a chemical equation, it reads:



Phosgene plus water results in hydrochloric acid and carbon dioxide. The water is furnished by the lungs of the victim; they are then destroyed by hydrochloric acid and inflated with carbon dioxide which, although harmless, impairs the normal action of the lungs. This chemical formula also explains why phosgene is fairly harmless in rain and why breathing through a wet piece of cloth gives some protection.

That gas masks give full protection is evidenced, not only by tests and war experience, but also by a

survey of casualties. Colonel Cummins questioned one hundred twenty gassed French soldiers who had been victims of a German chlorine-phosgene attack on June 5, 1917. He found that thirty-nine of them were caught by surprise, thirty-two had masks that did not fit them, thirty had their masks displaced in combat, four had obsolete types of masks and fifteen had removed their masks too soon after the attack. Not a single one had suffered because the gas penetrated his mask.

But this statistical survey of the casualties of a single engagement also shows that phosgene can produce many casualties even with well-trained troops. Which proves that its use in warfare will be continued.

THERE EXISTS an extreme group of theorists who are ready to think the

career of poison gas that began during the World War came to an end with the conclusion of the same war. Their argument runs about as follows:

New poison gases are so unlikely that their possibility can be denied. And even if somebody found such a "super gas" as the alarmists used to predict, it is questionable whether it could be manufactured. Mustard gas plants had, as a rule, more "casualties" than fighting front units of the same number; there is no reason to increase the burden of home casualties if the number of field casualties of the enemy does not increase faster.

Gassing of the enemy's capital, "to sweep away the government in an avalanche of terror" is flatly impossible. To drown, say Berlin in mustard gas, one would need about 10 grams per square yard. That makes not less than 1,800 tons of mustard gas or, roughly, 3,800 tons of mustard gas bombs. To carry this amount more than a thousand fairly large bombers would be necessary, which would have to arrive without losses and would have to drop their bombs simultaneously on a calm day. If this theoretical example is compared with an actual example, one begins to feel that it is still much too favorable. Between March 11th and March 14, 1918, the Germans fired 150,000 mustard gas shells into the villages and valleys of the Cambrai salient, an area like that of Central London. The result was 4,500 casualties; 50 of whom died. Professor Haldane, who found this example, remarked that the casualties, if it had been Central London, would have been about ten times as high—"but if 150,000 high explosive shells or their equivalent in bombs had been fired hardly a house in Cen-

tral London would have been left untouched, and the dead would have been numbered, not in hundreds, but in tens of thousands."

If militaristic people want to kill, they only have to comply with the popular demand "no poison gas" and fire high explosives, regarded as honest by the majority of the population. Actually high explosives are much worse than mustard gas. It is a fairly reliable estimate to say that of five soldiers wounded by high-explosive shells, one is going to die while the ratio for gas casualties is about fifty to one.

Ergo, concludes this school of thought, shells and bombs containing anything but high explosives are a waste of material and effort.

It would be, if the success of a war were decided by the number of killed enemies. But the "measures reluctantly taken to compel friendly relations" (war, for short) do not aim at extermination. They aim at subjugation with subsequent reparations and as little spirit of vengeance as possible.

It is for that reason why war chemicals will stay. Phosgene, although practically harmless to mask wearers, reduces the vigor of fighting troops by about twenty-five percent, because they have to wear a mask. And it always produces some casualties. If troops were fully equipped with protective clothing against mustard gas, it would lessen their vigor even more. But mustard gas is now regarded mainly as a defensive gas, because it is too persistent. In good, warm weather it lasts for three days in the open; in rainy, cold weather three times as long. In corners where wind has little access it lasts for a month, and in closed rooms, like old dugouts, for several years! For that reason it will be used only against such enemy posi-

tions one does *not* want to occupy, and maybe against cities in the hinterland for the annoyance of the civilian population. Russian experts, like Khlopin, suggest it especially as "chemical barbed-wire fence" in abandoned positions, and have even designed spraying cars for contamination of the ground. The latter could also be done by airplanes, but "raining gas" works only from altitudes of not more than twenty or thirty feet—and cannot be used against an armed enemy.

As for the sternutators, they will probably remain in use for their nuisance value; they force the enemy to wear an additional mask filter, which increases breathing resistance and reduces his interest in excessive activity.

Since the main purpose of gas is to annoy the enemy in a number of ways, there has been some wishful thinking about gases that do not cause death at all and that are, at the same time, somewhat more potent than the known lacrimators. A perfect sleep producer would be beautiful, and a powerful regurgitant that makes everybody unspeakably miserable for two or three days would be even better. But it seems that neither of these two exists, at least not in a variety that would be suitable for military purposes.

Poison gas is the biggest and, at any event, the most talked about chapter in chemical warfare, but it is not the only one. Two others are at least as important, smoke and flame.

Smoke screens are very useful to conceal troop movements from the enemy or to make him guess about movements that do not take place. They are also nice to confuse the enemy's troops who cannot see what their neighbor is doing, especially since they would have to don gas

masks as a protection against possible gas shells that might or might not come with the smoke shells. Smoke screens will be important in any war to come; the more so since they can be made from cheap and abundant raw materials. Sulphur trioxide (SO_3) is excellent and zincchloride (ZnCl_2) is sometimes even better.¹⁾ Another excellent smoke producer is white phosphorus, which causes burns if used against marching troops and might also cause a conflagration, both intensely annoying happenings.

THIS LEADS to the next chapter in chemical warfare, the combat with incendiary projectiles, one of the oldest forms of warfare known to mankind. There is hardly a type of combustible material that has not been tested and used, but again the search narrows down to two well-known ingredients: oil—in the form of solid oil—and thermite. Oil, because it spreads when burning, and thermite because it has such a high temperature—between 2,500° and 3,000° C.—that it ignites even the wood of a smooth parquet floor from above—which is much harder to do than most people imagine.

The thermite reaction was discovered in 1894 by Dr. H. Goldschmidt, as a means of reducing metal oxides. Thermite is simply a mixture of pulverized aluminum and the oxide of another metal. The proportion that is most efficient in the case of iron oxide—ordinary thermite—is seventy-six percent iron oxide and twenty-four percent aluminum. The reaction is a bit hard to start, but barium superoxide and potassium perchlorate, mixed with magnesium metal have been found reliable.

¹⁾ Titaniumtetrachloride is also very good, but not as available. The chemical reaction which produces the dense white smoke is the following:

$$\text{TiCl}_4 + 4\text{H}_2\text{O} = \text{Ti}(\text{OH})_4 + 4\text{HCl}$$

Then thermite burns very rapidly; two pounds of the mixture do not need more than five to six seconds. Because thermite is a powder, there have been many attempts to "bind" it, molten sulphur seemed ideal, but it then burned with explosive violence. The most perfected form of an incendiary bomb is probably the German thermite-elektron "baby bomb," which weighs only about two pounds. It has no dead weight, the metal of the bomb being the alloy "Elektron," consisting of 40 percent of magnesium and 60 percent of aluminum, a light—spec. weight 1.8—and useful alloy which burns with a blinding flame if ignited by thermite.

About these bombs there has been a similar theoretical controversy as about poison gas. Some experts claim that they are the only efficient airplane bombs. Each bomber can carry at least a thousand of them, each bomb will start a conflagration and render the fire department and volunteer fire fighters helpless by the multitude of fires, so that many fires flow together into one and the whole city burns down.

Another group of experts point out that the individual bombs will not be aimed and that less than forty percent of the area of a modern city is covered with buildings. Furthermore, thermite fuses do not always work—every fourth failed to ignite in tests—and the hundred odd fires that might be started by a single raid all start small and may be extinguished fairly easily by a corps of trained volunteers. Thus one expert came to the conclusion that: "Incendiary bombs will soon be forgotten again; demolition bombs charged with high explosive are more effective and also start conflagrations if they hit suitable material."

It is possible that incendiary

bombs may not be used against cities, but another type of target for them might prove very annoying. The French newspaper *Progrès de Lyon* carried under the date line of July 29, 1916, the following item that furnishes food for thought:

The incendiary bombs by means of which the Allies destroyed the Bulgarian crops near Monastir are an Italian invention. They are very light, weigh less than 100 grams—appr. 3½ ounces—began to burn only after they struck, and burn for a quarter hour even on moist ground. The governments of France and of Serbia are contemplating to use them to destroy the large grain fields of Hungary.

THE ORIGINAL question whether chemical weapons will find application in coming wars has already been answered to a good extent in the foregoing discussion. But it may be useful to repeat the results in condensed form. Smoke shells and bombs will certainly be used extensively. Incendiary bombs will most probably be used, and as for poison gas, it can only be said that the three main types will find application whenever prevailing conditions look promising.

The prospect of poison gas, it may be added, is really not as terrible as some writers want the world to believe. Strangely enough poison gas is a very humane weapon of war. I admit that the term "humane war" bears a suspicious resemblance to "painless torture." But there certainly are degrees of inhumanity and violent explosions and flying steel splinters are evidently less humane than chemical agents. If soldiers are afraid, they are not afraid to die, they are afraid to be mutilated and crippled for life.

Poison gas does not cripple its victims. Very careful and complete surveys have shown that there were

neither more cases of pulmonary tuberculosis among phosgene victims than there are normally among an equal number of ungasped people, nor were there more cases of blindness among mustard gas victims. Even if all the doubtful cases were ascribed to gas, the number of cases of blindness was far less—in fact, a very small fraction—than that caused by other weapons. It is true that gas blinds all unprotected victims for a short time, say three days or a week, but unless they actually got drops of the liquid into the eye, recovery is usually complete.

The British surveys of permanent

disabilities after the World War showed that 2 percent were due to gassing, 35 percent due to wounds, and 63 percent due to diseases. Of the gas casualties 88 percent did not apply for pension at all, of those that did only 0.6 percent were more than 80 percent disabled, the majority were disabled between 10 and 20 percent, usually in the form of neurasthenia or asthma.

There is no other weapon that permits such a high percentage of its victims to recover completely, which usually quenches the thirst for vengeance. And that is still another reason why the magic bullets of chemical science have come to stay.

Table of the most important war "gases."

Chem. Name	Chem. Formula	known since	boiling point	state at room temp.
LUNG IRRITANTS or SUFFOCANTS (GREEN CROSS GROUP)				
Chlorine	Cl_2	1774	$-33.6^\circ\text{C}.$	Gas
Carbo-oxychloride (Phosgene)	COCl_2	1811	$8^\circ\text{C}.$	Gas
Trichloromethylchloroformiate (Diphosgene)	ClCOOCCl_3	1915	$128^\circ\text{C}.$	Liquid
Chlorpicrin (Klop, German)	CCl_3NO_2	1848	$113^\circ\text{C}.$	Liquid

IRRITANTS or STERNUTATORS (BLUE CROSS GROUP)

Diphenylchlorarsine (Clark I, German)	$(\text{C}_6\text{H}_5)_2\text{AsCl}$	1881	$333^\circ\text{C}.$	Solid
Diphenylcyanarsine (Clark II, German)	$(\text{C}_6\text{H}_5)_2\text{AsCN}$	1916	$360^\circ\text{C}.$	Solid
Ethylchlorarsine (Dick, German)	$\text{C}_2\text{H}_5\text{AsCl}_2$	1881	$150^\circ\text{C}.$	Liquid
Diphenylaminarsinchloride (Adamsit, American) (Not used in World War)	$\text{HN}(\text{C}_6\text{H}_5)_2\text{AsCl}$	1918	$410^\circ\text{C}.$	Solid

LACRIMATORS or TEAR GASES (WHITE CROSS GROUP)

Xylylbromide	$\text{C}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Br}$	before 1900	$215^\circ\text{C}.$	Solid
Chloracetone	$\text{CH}_3\text{COCH}_2\text{Cl}$	" "	$119^\circ\text{C}.$	Solid
Bromacetone	$\text{CH}_3\text{COCH}_2\text{Br}$	" "	$136^\circ\text{C}.$	Liquid
Benzylbromide	$\text{C}_6\text{H}_5\text{CH}_2\text{Br}$	" "	$201^\circ\text{C}.$	Liquid

(Chloracetophenone, $\text{C}_6\text{H}_5\text{COCH}_2\text{Cl}$, a solid at normal temperature with a boiling point of $245^\circ\text{C}.$ was not used any more in the World War.)

VESICANTS or BLISTERERS (YELLOW CROSS GROUP)

Dichlorethylsulphide (Mustard Gas, Engl.—Yperite, French—"Lost," German, from Lommel and Steinkopf that introduced it.)	$\text{S}(\text{CH}_2\text{CH}_2\text{Cl})_2$	1855	$215.5^\circ\text{C}.$	Liquid
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THE MAGIC BULLET

99

Chem. Name
Chlorovinyldichlorarsine
(Lewisite or "Dew of Death")
and the direct acting poisons

Chem. Formula
 ClCHCHAsCl_2

known
since
1917

boiling
point
77.5° C.

state at
room temp.
Liquid

carbon-monoxide (CO)
prussic acid (HCN)
chlorocyanic acid (CICN)
arsenrichloride (AsCl₃)

Table of Lethal Concentrations
(according to A. M. Prentiss Ph. D.)
in milligramm per liter
with ten minutes exposure.

Phosgene 0.50
Diphosgene 0.50
Chlorpicrin 2.00
Lewisite 0.12
Mustard Gas 0.15

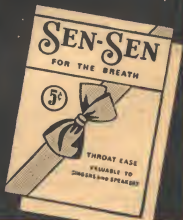
CO	5.00
Cl	5.60
HCN	0.20
Diphenylchlorarsin	1.50
Diphenylcyanarsin	1.00

List of important and reliable books
on Chemical Warfare.
Augustin M. Prentiss, Ph. D.: "Chemicals
in War" (New York, 1937)
Prof. J. B. S. Haldane: "Callinicus" (Lon-
don, 1925)

Prof. James Kendall: "Breathe Freely"
(Edinburgh, 1937)
Edward Vedder, M. D.: "The Medical
Aspects of Chemical Warfare" (1925)
Arnold Vatter: "Giftgase und Gasschutz"
(Stuttgart, 1934)
Major S. J. M. Auld: "Gas and Flame in
Warfare" (1925) obsolete in parts.
Prof. Dr. Fritz Haber: "Fünf Vorträge aus
den Jahren 1920-1923" (1925)
(Brit.) War Office: "Manual of Treatment
of Gas Casualties" (1930)
Professors Henderson and Haggard: "Nox-
ious Gases" (1929)
Dr. R. Hanslian: "Der Chemische Krieg"
(1927)
Rumpf: "Brandbomben" (Berlin, 1931)
"Medical Aspects of Gas Warfare" (Vol.
XIV of The Medical Department of the
U. S. Army in the War) (Washington,
1926)



Bad Breath Travels Far!



Don't Offend... Use Sen-Sen

BREATH SWEETENER . . . DELIGHTFUL CONFECTION

REINCARNATE

By Lester del Rey

A man's senses are liars—but consistent liars. If a man lost his body, could he learn the lies of another set of senses—?

Illustrated by W. Kolliker

I.

THORNE BOYD lay in a dark tarry pit under black stars that threw out hot blinding points of jagged lightning. And the lightning was aimed at him, crashing down in a steady tumult of sound that shattered into his mind and kept him from fainting. Where the pin point lightning struck, pain lanced out with soul-tearing force that threatened to sear his flesh from his bones. It was hot and cold, and all the sensations of a lifetime seemed determined to pile up on him in one malefic swoop.

The sensation was too much for his body; it tore itself away from him, leaving his brain stranded in the pit, and went tearing off through the turgid blackness. Without senses, his mind yet followed it, striving to draw it back.

"Come back, body!" he yelled at it, but there was no sound save the thundering yammering of the lightning. That seemed in some mysterious way, to sense his ultimate nakedness, for it crashed down more fiercely, and the black stars threw off their veils, revealing themselves as vultures soaring in a murky sky. With inexorable precision, they wheeled slowly down toward him, beady red eyes feasting on the sight of his naked brain.

Wild thoughts ran through his

mind. "Poe'd love this—only they aren't ravens." Then there was no time for thought. The monsters were so near that their wings beat a brazen cacophony in his ears. He had to leave. In a frenzied struggle, he thrust out wisps of matter from his brain to serve as legs and began running, running—but the smooth surface of the pit held him fast, and his false legs were too weak. The birds sank lower. One of them came to rest.

A strong beat, as of a heart, pulsed madly through his mind, and he let out one frantic cry that reverberated in a pitch too high for sound. Then his mind tore free and went soaring down and away, through Stygian depths that went on endlessly, toward some unknown goal. Something snapped.

"Crazy dream," he thought. Or was it? He was still in darkness, set with jagged flashes of light that formed no pattern, and sound that rushed on in a muffled discordant roar. Pain was all about him. But the insanity of fear was gone, and he began groping for a rational solution.

He could not feel his body, though that was due to the pain, probably. There had been an accident—or was that part of the dream? And today was to be his wedding day! He struggled again to get up, but



*The world went mad in a burst of shrieking flame
and pain as the atomic power switch went home—*

his only response was a fresh stab of pain. Well, if he had to lie there, there was no other solution. Maybe there had been an accident, fatal—and this might be Hell. It certainly wasn't the other place.

Boyd settled his mind into rough order and subdued the larger part of the fear. The immediate past was still clouded, but perhaps if he went back over it, starting at the beginning of the day, some clue would come. If nothing else, a chronological review would take his mind off his present condition.

IT HAD BEEN the big day toward which they had been working. The smokestacks were throwing out their columns of inky oil smoke, telling of power feeding into the turbines that furnished the station with a steady, dependable supply of high-voltage direct-current electricity. Allan Moss, old and bent, but still with the hot fire that had made him the world's greatest mathematician and physicist, was helping Boyd inspect the safety suits.

"Lot of good they'll do if anything happens in there," he grunted. "You better let me go in alone, Thorne."

Boyd shook his head, and his eyes traveled past to a figure motioning for him around the corner. Moss followed his gaze and chuckled. "Go on, son, don't keep her waiting."

Joan Abbot's dark hair was flying in the wind, her eyes filled with bubbling devilry that seemed never to leave them. "Meany," she greeted him. "I'll bet you forgot that tomorrow was to be our day. You and your old work."

He grinned at her awkwardly, not quite sure of her banter, but pleased by it, as always. He needed her lightness and gaiety, her willingness to find the sunnier side of

everything in direct contrast to his own character. Seen through her eyes, life must be a wonderful thing. Time had taught him that under the effervescence and impulsive enthusiasm there was a mind he could meet and respect.

"I haven't forgotten. Moss has agreed to drive us away as soon as he can get rid of your father, and I have the license in my pocket. Only I wish you'd let me tell your father we're being married."

"No, you can't do that. Wait till it's over and I'll spring it on the old dear. Hm-m-m, and won't he growl, though! But it never does him any good." She gurgled and stretched herself up on tiptoes to grab for his neck. "Let's run away now! Let's, Thorne!"

"No can do." He scraped his unshaven face down hers, grinning slowly as she slapped at him. "Anyway, you're only teasing me."

She crinkled her nose up at him. "How'd you guess? Hm-m-m!" The pause that became necessary was definitely not unpleasant. "All right, Pickleface, you can go back to your work, but if you leave me at the altar—"

MOSS LOOKED UP at them and tucked an almost paternal smile away in the corner of his mouth. "Been poking your nose into things that were none of your business again, youngster?" he asked.

She nodded, peering over his shoulder at the suits. Hm-m-m. One of the men opened the casing around your atom-smasher and let me look inside. I promised him I wouldn't tell you who he was."

"And did you understand anything you saw?"

"A little. I've been studying lately, so I'd know what Thorne is doing. He'll talk about his work

all the time, and a good wife should understand, shouldn't she? What's a restrictive field, Dr. Moss?"

Moss shoved the work aside and sat down opposite her. He was always willing to answer her eternal questions, and managed, somehow, to make it clear. Something inside the old scientist went out to the insatiable curiosity that filled her. "A restrictive field is just what its name implies. It's a field of force generated around something and designed to hold that something within certain limits or patterns. You might say that a magnet exerted such a field on iron filings to keep them from scattering and line them up in definite patterns. Only we're using a field to hold neutrons in the uranium 'fuel' and not let them dissipate uselessly as they try to. Understand?"

"Hm-m-m. Well enough." She ran curious fingers inside the suit and examined it. "What's this for?"

"In case there's trouble inside. Just an added precaution." Boyd picked her up and set her out of his way while she squeezed his nose with a little hand. The cooing gurgle she made embarrassed him, but he wouldn't have made her stop it for an extra arm. "Dr. Moss and I aren't taking any risk, you see."

She appealed to Moss again, a serious note in her voice. "Why do either of you have to go? Couldn't you control it from outside or use automatic machinery?"

"Not well enough. Automatic machinery can't do things it isn't designed for. When we start ripping atoms to pieces, we'll have to expect the unexpected. That's what men were built for—emergencies."

She brushed her hair away from troubled eyes, and a frown had taken the place of her impish deviltry. "Thorne, I'm scared. Call it

a sudden premonition if you like, but don't go in there. Or let me go with you. Please."

"You stay out here and it'll be over before you know it. There's no real danger," he assured her. "If we thought there were, we wouldn't be going in, would we?"

"But if there's no danger, why can't I go in with you?"

"Because—" Feminine logic was too direct at times. "Well, your father—"

"Speaking of me?" The voice came from behind them, thin and crisp, that of a man used to giving orders without the need of backing them up with anything but money. They saw the tall heavy figure of John Abbot entering the doorway.

Moss covered quickly. "Just warning your daughter not to go fooling around while the experiment's in progress. She's a science bug, you know, poking her nose into everything. Ordinarily, I like it, but not today."

"O. K., meanies." Joan grinned at them, though it looked a little forced, and kissed her fingers at Boyd with her back toward her father, then went tripping out, an odd look of determination on her face. Abbot squatted down on a box and watched them dourly.

"Better work," he grunted. "Some of the men are complaining about the money we've invested in this, with no results for two years. I still don't see why you needed all this for an experiment."

"I warned you it'd take five years, maybe." Moss had the patience with work and men that necessity develops in scientists. "And in dabbling with atoms, there is no small-scale experiment. The results gained then mean nothing. Finished, Thorne?"

"Yeah, the suits are in good condition. Mica's clear and the asbestos hasn't been damaged."

"Good." Moss picked up one and Boyd followed with the other, leaving Abbot staring after them. They slipped through the doors of the great barnlike experimental building and began donning their suits by the control table at one side of the forty-foot shell incasing the atom blaster.

Boyd looked at Moss and voiced the question that had been troubling him for months. "How'd you ever pry the money out of Sourpuss in the first place?"

"I didn't. He heard the government was planning to finance my experiment, and came after me on double-quick. Had visions of what government control of atomic power would mean to his utilities, and got the other financiers in with him. It's the first time he's had an employee whose orders had to be followed, and he doesn't like it." Moss chuckled. "Wonder what he'll say when you run off with his daughter?"

"Lord knows. Probably try to fire me, but I'm counting on you and her to pull me through that, if our work succeeds; anyway, if it does, he won't kick too hard. What are you planning to do after this is over?"

"Publish my monograph on restrictive fields and mathematical concepts of atomic disruption—the one with 'the new type of math I've spent two years teaching you.'" His heavily gloved fingers found the zipper on the suit finally and pulled it up, muffling his words. "After that I'll probably visit Norman Meisner, at City Hospital. Haven't seen him for years, and he's invited me down to see his latest miracle."

Thorne grunted as the zipper on his own suit slid up. "I was reading about that miracle; something about his taking a dog's brain and putting it in some mechanical body where it learned to wag its tail, wasn't it? The newspaper account gave practically no information."

"Something like that. Ready?"

"Ready!" Boyd watched the indicators as Moss turned on power into the "restrictive fields" that would limit the spread of neutrons and stabilize atomic breakdown. For a split second he imagined he caught a flash of movement in one corner of the building, but there was nothing there when he looked. He turned back to the panel. Power was already swelling out.

Moss leaned over, yelling above the sound of the machinery. "Looks good, eh?" A sudden flash of red sent him darting back, and his hand groped for a switch. Then a roar of light, heat, and sound cascaded out from the big shell!

For a minute fraction of a second, there was a scream in Boyd's ear, and he felt his hands clutch at the control switch. Then his mind blacked out, leaving only a numb nightmare of agony.

IT COULD only have been a few minutes later when the agony brought consciousness back again. He made groping movements that sent cold throbs up to join the killing pain, and from the motions, a picture of his own condition sprang into being. His arms were half gone, there were no legs, and the body of which he had been so sure was only the withered hulk of a man—a cinder left miraculously behind to mark the fury of the atom flame! From the pain, part of his face must have been torn away, and

sight and sound were gone.

Desperation killed the pain temporarily, and he fought to shout. He was on something that gave like sand, and the dull thuds around him could be only the Earth vibrations of footsteps coming at a run. The blast must have thrown him free of the building, out onto the ground, and the other men were just coming up.

A faint idea was in his head, though the torture of existence fought against it. Sand below him, the stump of an arm—and no other means of telling what he wanted.

A convulsive heave threw him to what should have been his knees, and the right stump of his elbow bit down into the sand. He had only muscular memory to guide him, and the letters would have to be big. "M E I S N E R," the stub scrawled, and he fought backward against restraining hands that were meant to soothe him. Then: "C I T Y H O S P—N—" The "Y" was only half completed when his body refused to stand more and collapsed.

Now he was here—wherever here was—with only a dim idea that too much time had passed. The review of the past had only suggested that he was dead and in Hell or in the City Hospital. And that would mean—

The brain of a dog in a metal case, wagging a tail. Meisner of City Hospital, with the charred body of what had been a man, and only the first few experiments to pave the way. Boyd writhed mentally in the fantastic horror to which he had awakened and hoped suddenly that he was dead and in Hades. That at least would give him a background of familiarity. The other possibility lay beyond the imagination.

II.

NORMAN MEISNER had left Germany as a boy. Had he remained, he might have become a great engineer as he had planned. Instead, by a long chain of circumstances, he now held the reputation of being the greatest experimental physician on the American continent, and his word was law in the newly built experimental wing that had been added to City Hospital. Medicine was finally learning the value of "abstract" science.

"Morning, Papa Meisner," a trim nurse greeted him, and he chuckled amiably at the surprised expression that crossed the face of his companion.

"Discipline is not good, eh? But when it is brains that are needed, should a man bother with so small things? No, I think not. It is when they are happy they work best."

Dr. Martin nodded in half agreement. "You seem to get results, anyway. That's all the Board's interested in. It isn't official yet, but they've decided to vote you the money you've been asking to continue this latest thing of yours."

"I don't need their money now. It is recently I have acquired a new donation—for experimental work only—from a rich man. I have work from him to do, as you shall see after this." He led the way down the hall to his private laboratory, and smiled at the tall young man waiting outside. "The reporters all here, Tom?"

"All here. Hello, Dr. Martin."

Martin nodded at him. "Finished your course yet, Tom?"

"Full-fledged engineer now. But I've been helping dad with the mechanical end of this new work—sort of *ex officio*."

THEY FOLLOWED Meisner in and worked their way through the representatives of the press until they were standing beside a gleaming metal box that lay on a bare table, with only a small magnetic speaker in front of it. Its smooth surface was broken by a hole at one end and a short rubber tube that projected from the other. From inside came a faint hum and a regular muffled thudding.

"Good morning, gentlemen," Meisner greeter the reporters. "Now if you'll let me run this little show to my satisfaction . . . Rex, wake up!"

The tube at the rear came to sudden life and began twitching in a haphazard fashion, and a rough whining sound was emitted from the speaker. The reporters stared at it curiously, though they knew roughly what it was.

One of them started to ask a question, and the tube stopped its beating at the new sound; the speaker made a hoarse sharp noise, almost like a bark. The barking continued until Meisner made soothing sounds that quieted it. The plump little physician patted his stomach fondly, opened the top of the box and pointed inside.

"Life," he began, "must have food and air for energy, water to serve as a liquid medium, no? Good. And it must have blood to carry them, and something to remove the waste matter from the cells, or the blood. Also, to survive, is needed white corpuscles or some other defense to kill destructive organisms, such as bacilli. Here, I have them all. When my Rex is run over, I fix him up a new body for his brain—not good, maybe, but better than nothing.

"See, here is the brain case and the big blood vessels are connected

to this mechanical heart—a refinement I make on the Lindbergh-Carrel pump which you know, maybe. Here is a jet air infuser for a lung; blood goes in, loses carbonic acid gas, and picks up oxygen. So. Then up through the brain, down into this glass kidney—the same that Lindbergh also worked on—and the life-poisons come out and are a trouble no more. This is the stomach, where predigested food enters the blood by osmosis."

The newspapermen were impressed, but hardly amazed. Most of them had seen pieces of chicken's heart kept alive by the use of the Lindbergh pump and kidney before. This was merely a refinement of that, though the use of an entire brain was a big forward step. "I suppose you put in new blood as the old red corpuscles break down?" one of them asked.

"Ach, that is the beauty of this; blood I do not use." Meisner waited for their reactions until satisfied that they were properly curious. "I have a new substitute for blood. It carries food, air, and water, just as does the real, but there is no breaking down. That is the great advance."

Dr. Martin stared at him with sudden interest. "How about its effect on the cells? I suppose it's some nontoxic organic compound with a loose affinity for oxygen, but do the cells work well with it?"

"Perfectly. And"—he tapped a small chamber that had been overlooked—"here it is sterilized. With real blood, that could not be, no? Real blood has white bodies that fight disease, but my blood washes the germs through to this and *poof!*—they are dead. I have given my brain all that is needed for life."

"Yeah, but how'd you get the

brain in there without letting it die? And what starts the magnets that wag its 'tail'?"

Meisner shrugged. "Have you no imagination? First the blood vessels are opened and reconnected one by one, so life does not stop, until the artificial heart does all the work. Then my liquid replaces the blood, and the brain is moved to its new case—not before. And the nerve endings, which conduct faint currents of electricity from the brain are hooked up to platinum filaments. So. And their so faint electric impulse is boosted in relays to operate the magnets and speaker which is connected to two modulators, one for the whine and the other a bark."

He held up his hands to silence their instant protests. "So, you know nobody can trace out individual nerves, eh? That is true. But I can locate nerve *bundles* that lead to the ears, throat and tail, and separate the sensory nerve bundles from the motor impulse bundles. I attach the bundles on the right places, not separating nerves, and hope maybe the brain gets some sensation—and it does. Two months Rex has had to learn in, and already he knows my voice and his name. Rex!"

Again the speaker whined and the tube that served as a tail twitched. It beat in a hopelessly disordered fashion, but apparently any beat seemed better than none to the dog's mind. The reporters examined it again, checked up on their information, and began filing out.

"Going to use it on a man sometime?" one of them asked as a parting shot.

"Why not, maybe?" Meisner turned to his son as they left and grinned. "Maybe we use it on a

man, eh? Tom, shall we honor the fine Herr Doktor Martin with our latest efforts?"

Tom's grin answered him. "If it won't shock the esteemed Dr. Martin."

Martin stared from one to the other, making no sense of their expressions. "Why so darned mysterious?"

Meisner took his hand on one side, and Tom marched around him to the other. "You now have the honor, Dr. Martin, of seeing—Oh, skip it, come on and see for yourself. It really isn't funny, after all."

Dr. Charles Martin followed along meekly enough, as they led him, and light began to dawn. Unless he was seriously mistaken, what he was about to see had something to do with the reporter's last question.

III.

BOYD FOUGHT against himself in the crazy world of chaotic sensation to which he seemed doomed, and sudden darkness rolled down over him, cutting off the disordered jumble of varicolored light that had been torturing his eyes. With a sense of pride he realized that he had finally closed his eyelids.

But the dark emphasized the solitude of the place. There was still a rushing confusion of sound, but the hours he had lain there had dimmed his consciousness of it until it formed a hazy pattern in his mind. The pains were less sharp now, mercifully.

But there was no mercy for him. In spite of himself, his mind insisted on speculating on death, though the more rational thoughts insisted that this could not be death.

A sudden torrent of fresh sound struck down on him, not loud but

rancous in disorder. The sounds grew louder and changed, and he guessed that something or someone was coming closer to him. He tried to see, and again his eyes acted without his knowledge of how. Stronger light lanced out, flickering for a moment, and then burning hotly. His struggles to close his eyes again only resulted in a harsher glare, as if his pupils had dilated.

The confused sounds kept on, and there was something in the rise and fall of them that suggested speech. They were clearer than the other noises. Boyd cried out, or tried to, and was startled to hear a grating jangle. It couldn't have been his voice, yet he was sure it had come from him.

The other noises stopped momentarily, and then the sound he had made was repeated, slightly changed, but recognizable. Surely no human throat could have imitated it—a hyena perhaps, but not a man. He tried again, getting a different noise this time, and it was repeated by the other.

There was silence for a moment, and a clear tone broke in, different from the rest. It was hoarse, but lacked the confusion of all former sounds. "Dit-dit-dit-dit," it said, in short little clicks. Then there was a slight pause. "Dit . . . Dit-daah-dit-dit . . . Dit-daah-dit-dit . . . daah-daah-daah."

The short clicks and longer ones resembled something he had heard. He groped around in his mind, seeking the answer, and finally found it. The irregular frequency was that of a telegraph sounder, and the clicks must be code. It came again, and he listened more closely, piecing out the letters. "H . . . E . . . ? . . . ? . . . O."

Hello! That was what they were saying. But his knowledge of code

was too limited. As a boy, he had known a friend who operated a ham station, but all he had ever learned were the symbols for THE, I, and SOS. That gave six letters out of twenty-six. He started to return the signal they sent with whatever noise his throat chose to make, depending on the length instead of articulation sound, but thought better of it. If he made no reply, they might realize he could not understand.

There was a conference of noises, and the clicking again, all short this time. One click, space, two clicks, space, three— They were running over the numbers in the simplest of codes. Clumsily he repeated, and the numbering left off. Then the clicker reverted to a series of mixed short and long sounds, with spaces coming in irregular order. He counted the sounds between spaces, and made out twenty-six. As the signals started again, he checked. The fifth was E, the eighth H, and the others fitted in. They were sending the alphabet for him to memorize. He selected the most necessary letters and concentrated on them until he was sure he could make an intelligible sentence.

"Where am I?"

There was an excited buzzing of sounds, and the clicker broke out quickly. "-o- are i- the -it- hos-ital, to -et well." So he was in City Hospital, and they were trying to patch up what was left of him. But how much was that? Something was wrong with his sight, his hearing, and his voice, and he had no ability to move any other part—or at least could feel no response.

The alphabet was running through again, certain letters emphasized by longer spaces between them this time. He made a sound when satisfied that he knew them,

and the sounder began picking out words slowly and carefully.

"This is Meisner. You are making out well. You must rest now. We will make you well. We must leave now. The machine that makes ABC will stay to keep teaching you. You must not worry."

Even the simple sentences brought half comfort, suggesting as they did the possibility of communication. Boyd made the proper sounds for "yes" and the noises that were voices began to fade away. The machine kept up its alphabetical discourse.

They were almost gone when Boyd remembered the questions he must ask and shouted. There was a series of increasing sounds, and a voice noise answered.

"Moss?" he spelled.

"Dead!"

"How long?"

"A month," the answer came.
"No worry. All is well."

THEN the voices receded again, and he knew he was alone. So Moss was dead, and it was a month since he had been conscious. They must have kept his mind drugged while the pain or healing was going on, and the ache he was now experiencing came from muddled sensations. A month, while he had lain here in a fog, and the world had gone on without him.

It must have been Hell for Joan, he thought. Next time the men came to see him, he'd ask about her, if he wasn't too horrible for her to see. Perhaps it would be better if she never visited him. As a future husband, he was a washout.

The clicking of the machine called his mind back, and he turned his thoughts to the code, glad for a reason to forget all the troubles that were looming up for the future.

Hours sped by, and the machine buzzed on, leaving the alphabet for simple primer sentences. He seemed to have no desire for sleep, and the light flashes finally disappeared, leaving him in darkness that was soothing. Some of the noises in the background disappeared, and he realized it was night.

The machine went back to simple words, and there was a new element. "Man" it spelled out. "M." The letter was followed by a different noise, then "A" and another. Finally the whole word was spelled in completion and a longer noise that resembled the voice sounds of the men. They were trying to teach him to speak!

The sounds that followed the letters seemed all alike at first, but slowly he noted minor differences that clarified as he studied them. They bore no resemblance to speech as he remembered it, being a jumble of whistles, buzzes, and things for which there was no name. Dutifully he tried to imitate them, but the response was disheartening. In the hours that followed he learned there were just thirty-one sounds he could make, and that making them in any logical order was going to take education. His voice refused to respond to the old patterns of speech in any sensible fashion.

But slowly the distinctions between the sounds he could hear became plainer, and he was able to grasp in a dim way the meaning of a few words out of each simple sentence before the code form was spelled out. It was slow grim work and only the desperate urge for knowledge of himself drove him on.

Light was streaking back again as he made his last efforts at speech. Surprisingly enough, at the twentieth time ordered sound came out. "I am." The words that man had

first spoken in the dim past when consciousness of self was new. Now they marked a milestone in his progress as great as that first effort.

He could not repeat them, though he tried. But what he had done once could be done again, in time; he might learn even to recognize the weird conglomeration that constituted speech for him with a semblance of ease. At least he would not be doomed forever to solitude.

He was! For the time, that would have to suffice.

IV.

"THE PRINCE kissed her lightly," oozed the telegraphphone with nice unction, "and Sleeping Beauty opened her eyes and smiled at him. Then they were married and lived happily ever after."

Boyd swore mentally at the recording. It wasn't bad enough to stay awake twenty-four hours a day in Hell, but they had to furnish records to remind him of his sleepless condition. Not that he needed sleep, apparently. But a little merciful oblivion would have been welcome. Still, the machine was familiarizing him with the hoots and gargles that represented the spoken language.

Grumbling to himself, he turned his attention to the chart that hung over him. By a series of manipulations that normally should have made his eyes act in a distinctly abnormal manner, he finally focused on it and began piecing out the characters. They all looked like lobs of wax that had been left too long in the sun, but careful study was bringing some sense out of them.

He could recognize the straight lines now, and a few letters of the alphabet, though he had to take their word about the beauty of the

girl's face in the central picture. So far, motion was the only thing that registered properly, when he could keep it in focus.

"Like using the faceted eyes of an insect," he growled. Then it didn't sound right; he repeated it. That was better. His new voice still insisted on getting the whistle that went with "k" mixed up with the rushing cough that stood for "c."

Someone was at the door, coming toward him, from the sound. He waited until a moving blob registered on his eyes, looked for what he had come to know as a beard, and decided from its absence that his visitor was Tom Mcisner. There was another vague figure with him, thinner, and also without a beard.

"Hello, Boyd." Tom's clear-cut English identified him further. "I've brought you a visitor—Mr. Abbot."

Looking at the other, Boyd decided it did look something like Abbot. Careful inspection revealed the bald spot on the man's head, and he felt a sudden glow of pride at his achievement. Then it disappeared into the usual gloom. "Hello," he said slowly. "I didn't expect to see you, Mr. Abbot."

"And why not?" From the speed of the words, the question was probably meant to be good-natured, though the fine nuances of tone failed to register. "You've been costing me a small fortune, Thorne, so I figured I might as well see what was coming of it."

"You've been paying for me?" It was news to Boyd, though he had wondered about the financial end of it. "Why?"

Something that might have been a chuckle came from Abbot. "Not from sentimental reasons, as you've guessed. I've been paying because I need your memory and knowledge. When I saw what you'd scrawled in

the sand, I figured you'd learned something that might prove the solution to the problem of power, and took you to Meisner. What was it?"

"Mostly nothing. Instinct of self-preservation, I guess, made me write that. You've had experts go over the wreck?"

"Naturally, and they don't understand it. Some of Moss' notes are incomplete, and the equipment is pretty well ruined. The other investors in the work are yelling about the money they've put in, and I've got to show results." Abbot paused, and Boyd guessed which one of the investors was most worried about the money. "At least, you can supply the information in the missing notes."

"It wouldn't do any good, sir. All I know is that the field we'd built up collapsed just after it started, and the experiment went wild before the neutrons were dissipated enough for the reaction to stop. Theory doesn't explain that, and another test might give you more things like me. If I could go over the wreck and try again, I might find the trouble. But—"

"Good." Abbot picked up his hat and started to leave. "Hurry up and learn to use your arms and legs, and I'll see you don't lose if it works." He motioned Tom back and went out the door alone, leaving Boyd's mind in a state of numbed shock.

Learn to use his arms and legs! He'd been thinking of himself as a brain in a box, with nothing but the senses of sight and hearing, but that was apparently false. Now, perhaps he wasn't like the dog in the newspaper item. Perhaps—Fifty wild conjectures ran through his mind in the half second it took him to call Tom.

YOUNG MEISNER sat down within range of his sight, and his voice was low and calm. "I know, Boyd. Take it easy. We didn't tell you about it because we wanted you to spend all your time learning to see and talk. But you're about as complete as we could make you. Ever read any of those robot stories?"

"Yes, but—"

"Well, in a rough way, that's what you are now. There wasn't enough of your body left to save, so we gave you a new one. In some ways, it can't equal the old one, but it has points of superiority. The blood system insures your brain against disease or fatigue. You'll never need sleep because all poisons are removed as they form. You'll never have to worry about your body wearing out, because new parts can be added. And you'll probably live longer than Methuselah, since your brain cells are perfectly fed and cared for. For instance, the thermostatic controls that keep your brain and spinal cord at the right temperature are far more sensitive and dependable than the normal bodily methods."

Some of those, Boyd decided, weren't assets. He'd have given a lot for one night's sleep and forgetfulness, and the idea of living a long time might prove a mixed blessing. But there was no use of complaining about that. "How'd you do it?"

"By combining dad's surgical skill with what I know of engineering, and getting some outside help," Tom answered. "Your ears are vocoders, breaking down sound into its basic elements. For a voice, you have the opposite, a voder, that takes the basic elements and recombines them. We couldn't hope to recreate anything like the original, since nature, working with mil-



In that instant of time, he saw helplessly that the meter was slashing upward beyond the safety mark—and knew that another world-racking atomic explosion must come.

lions of unified cells, is devilishly complex. But the substitutes will serve fairly well.

"You have a television scanner for eyes, connected to the optic nerves, and the nerves governing your eye muscles are hitched on to change the focus tubes and move them about. We used a photoelectric cell to govern the iris setting, but you can control that to some extent. Incidentally, our biggest trouble was getting a television hookup that would work properly with lenses having a focal length short enough to give sufficient depth of field to your sight, and the wide-angle f:1.0 lenses had to be made specially.

"Most of the apparatus is located in your torso, of course, along with the new high-power accumulator coils to furnish power. Not having your atomic energy yet, that's the best we could do, so you'll need recharging regularly."

"Hm-m-m." In a hazy way, Boyd had figured out part of that for himself, but his chief interest was in motility. "What about the muscles in arms and legs?"

"Magnets. Dad planned on using motors and sliding shafts, but that would have taken a body the size of an elephant. We used thin disk magnets with a one-tenth-inch gap between them. A hundred of them equal a ten-inch gap, and there's no comparison between the two when it comes to pull exerted. Where the big gap might not work, the series of small ones pack in plenty of power. The old inverse-square law that applies to all force-fields, you know."

THE DOOR opened again with a faint creak, and Meisner's thick pronunciation broke in on them. "So?" He moved over beside his son. "So you tell our Mr. Boyd all about

himself, eh? All I hear now is how good an engineer you are to make a body like this. How you feel, Boyd?"

"A little better, now that I won't be cramped down in a box all my life. What about the sense that governs muscular movements?"

"You see, dad, he wants to know. You can boast about your part when I'm finished." Boyd made out that Tom and Meisner were grinning at each other as the younger man went on. "We used piezoelectric crystals as pressure detectors in the muscle piles. They should gauge the effort applied by the magnets and serve as a fair kinesthetic sense. Temperature sense isn't so important to you, but we used thermo-couples for that, and gyroscopes attached to the balance-organ nerves supply a sense of balance."

Meisner nodded. "And so you are a man again. A brain and spinal cord from nature taken, a body made from skill. We hook the nerves to wire filaments, indiscriminately, and they learn again. Maybe then you are once more complete."

"Sounds like a horrible mess to me," Boyd stated.

"Maybe. But it is nature that makes the so horrible mess. One million cells she puts in a muscle, and makes them work as one. A hundred little habits of thought that you don't know about she gives you by experience, to work those million cells. No, that we could not duplicate. We simplified, instead. That you could do all that you did before would be impossible, but that you could approximate normal activity—yes. Good, eh?"

"If I learn. But all the sensations I get are completely distorted."

Again Meisner disagreed. "Not distorted, but different. You are

again a baby. Are the eyes of a baby incomplete? No. But he has learned no habits of understanding the messages sent by his eyes, and he cannot fully see. Even a boy of five may draw a picture that to him looks like his mother, and to you or me, like nothing.

"It is the old senses that lie as much as the new. You must forget the old habits and new ones acquire. In his head, man sees upright, but the message on the nerves is reversed. Glasses have been built to reverse this, and for a time sight seems upside down; then, in a few weeks, the brain corrects, and all looks normal. Now it is without the glasses that sight is wrong. So. In time new habits you will learn, and then your senses will no longer distort."

Boyd turned it over in his mind, and partly agreed. Already sound was beginning to seem more natural to him, and there was some promise of his eyes working properly. He tried to see his body, but the movement of his eye-tubes was too limited for that. Meisner seemed to sense his desire.

"There is a mirror here." He moved away for a few seconds, and came back carrying something. Tom helped him adjust it. "So. Now look, if you must."

Boyd looked. At first, he saw only a vague blur, but as he analyzed it part by part, some meaning began to come out of what he saw. That was a straight line, that a curve, and another straight line at a forty-five degree angle. His mind built up a picture from the separate messages sent to it.

He was big, far bigger than any normal man; probably the problems of structure had necessitated that. And his head was too large even for his body. They had made little

effort to copy the human form accurately. Tubes stuck out in front of his face for eyes, and there was no nose or chin. He realized quickly that he looked less human than the various robots that had been built for stage exhibition purposes.

And in that body he was supposed to move about among the normal people of the world! There could be no concealing it in coats and hats, no hope of being anything but a freak for people to stare at. Men distrust the unknown, and he would have few if any friends. No home, no social life—no wife!

Surely he couldn't expect Joan to marry him in such a form. Perhaps that was why they had kept her from seeing him. He was a monster, a creation that even Frankenstein would have shunned as unholy. All that was left to tie him to the world of men was a job to be finished.

"All right," he said. "Help me sit up and put that mirror where I can watch myself. I've got to learn how to handle these muscles you gave me, if I can start the things twitching."

V.

THE razor blade was absolutely steady in the big hand and the hair moved toward it surely until it was split smoothly down the center. The other hand picked up one of the pieces, and this time the blade moved against the half hair, splitting it into quarters of the original.

Boyd tapped one finger against the palm of his hand in a clicking sound he used to express satisfaction; some of the old habits had been redesigned to work with the new body. Being made of metal made for steadiness, at least, as the split

hair proved, and the auxiliary lenses changed the focal length of his eyes to give him optional telescopic or microscopic sight. Now he slipped the lenses off and put them in the fur-lined pouch that was attached to his body.

Tom Meisner opened the door of the office and came in, his lips blue with the cold, beating his hands together to warm them. "All set, Boyd," he said. "The transformers just came in. Want I should start the men on them?"

Boyd grunted. "Guess so. Abbot's still climbing on me for being so slow. I'll go along and help with the installation." Tom had been doing good work since the return to the station, and he was glad to have the young engineer as an addition to his staff. He rose from his seat, a little jerkily as the faint giddiness of motion hit him. His balance sense still wasn't in perfect tune, and a slight dizziness usually accompanied any change of position. For a second, he moved his legs carefully, then sureness came back.

"The X ray plates for the transformer cores they sent O. K.?"

"Yeah, seem to be. I can't find a trace of flaw in any of the stuff this time. *Brr!* It's colder'n Billy-be-damned. How you can stand it without an—" He caught himself suddenly. "Skip it!"

Even though he had been largely responsible for Boyd's body, Tom still made those little mistakes. And his acceptances of Boyd as a man at such times bothered more than the frank stares of the others. It was bad enough to be an object of ridicule, but to have the other man start treating him normally and suddenly realize the difference was worse.

"I wouldn't get much good out

of an overcoat," Boyd answered his unfinished question. "It's a good thing you chose chrome steel for the foot plates, though, with all this slush on the ground."

His heavy feet made harsh plop-ping sounds in the muck that served as a constant reminder of his strangeness. One of the men stopped his work to stare as he passed, wonder still written large on his face, though Thorne had been at the station nearly a month now. Then the man turned quickly and too obviously back to his work, avoiding Boyd's eyes.

The men were uncomfortable, he could see, as they worked under his orders, setting the big transformers in place, coupling them up, and adjusting them. Some of them had worked with him before, on easy terms of camaraderie, and it was hardest for them. They tried their best to act toward him as if nothing had happened, and their efforts failed miserably.

Some of the new men made jokes about him behind his back and called him "Frankie," derived mistakenly from Frankenstein. That did not worry him; if men could treat his new body as a joke and be serious about the brain in it, life would be tolerable. But they pitied him, instead, and looked down at him from superior normality. They were a little too quick to accept his orders, to address him as "Mr. Boyd," to laugh at his attempted jokes.

He caught up one end of a beam the men were working with and twisted it around to the position they wanted. For a minute, they looked up with surprise and admiration, then it faded. Boyd's sharp ears caught the remark of one of them. "Why shouldn't he be strong? Automobiles got strong en-

gines, too. He don't need to show off in front of us."

"Shut up, damn it!" the other growled, but there was the same hint of dislike in his voice.

That's how it was. If he did what they couldn't, they resented it; if he failed to do anything they could, they were condescendingly pitying. He was a freak, something hashed together from an accident that should have killed him, and they had to take orders from him. There was no way he could win their respect or friendship, since those were reserved for men with human bodies and limitations.

TOM CAME BACK as the last transformer was being swung up and in by the donkey engine hoist. "Dad phoned he was coming out this afternoon to check up on your progress," he said. "Should be here any minute."

"Good." Thorne liked Tom's father better than anyone else he'd seen since the accident; the physician worked on bodies but respected only brains. "Abbot's dropping over, too, to let me understand just what each day's delay costs him."

"He would, of course. He was decent enough about it all when we still had you back at City, but now he thinks there's no more excuse." Tom glanced back toward the door and waved. "There's dad now— Hey! Watch it there!"

The friction clutch on the hoist holding the transformer was slipping and the mass of metal began to fall, wobbling sidewise. At Tom's yell, Hennessy, who was waiting for it, started to jump back quickly, but the awkwardness of fright tripped him. He sprawled out flat, clawing wildly, and the transformer began slipping more rapidly.

Boyd had no time to think of the

signals his brain must send out. He shot full power into the magnets and jumped forward in two twenty-foot leaps that brought him under it, his arms up to catch it. His head spun with sudden giddiness, but the weight in his arms slowed reluctantly, came to a stop, and he stood straining at the pull of it. It threatened to carry him down, but the full strength of the body they had given him resisted, fighting to hold it and retain his balance.

The other men shut their mouths and darted in now, pulling Hennessy out from under; the man had fainted. Then they came forward to catch at the transformer and help Boyd, but Tom's quick voice barked out. "Stop it! You'll do more harm than good."

Slowly he moved it, edging his way forward half an inch at a time until it came to rest over its supports. He let his knees flex slightly as it settled, then it was still, ready to be bolted in. As he let it go, a sick weight seemed to leave his mind. A few pounds or seconds more would have been too much.

He stopped to examine the metal on one arm, looking for dents or scratches, and finding none. For the first time, the full realization of the strength that was his came to him; four ordinary men would have buckled under the load. But there was no pride in it—the achievement was really that of the Meisners, who had built the body, not of himself. And the other men could hardly admire him for doing a mechanical job well with a machine for a body.

But the remarkable recuperative powers of his synthetic circulation system came into play almost at once, freeing his brain of the toxins of its efforts in commanding full power from the muscle piles, and he

felt no ill effects. Meisner stood beside him, raging at him hotly.

"Nincompoop! Maybe it's mountains you'll move next, eh? Is it no gratitude that you should try to destroy the life I gave you! Do you think you're all metal? One slip, and—*ploosh!*—it squashes you flat on the thin abdominal walls, and your nice new heart is *kaput!* Maybe you could live without a heart, eh? So. I think not!"

Boyd looked at the physician and there was a grin in his mind, though no change could show on his face. "Why all the fuss? You wanted to test me; there's your test."

"So. Maybe it is. And there is nothing now wrong with you but that you think too much about yourself and how different you are. You should forget that."

One of the men tapped Meisner's shoulder. "Did you mean the accident might have killed him?" he asked.

"And why not? The brain he has, maybe, is as soft as yours, the fool. Did you think he was solid iron?"

"No. No, I guess not." The man shook his head doubtfully and moved back to his fellows, where the unconscious Hennessy was slowly coming around.

A VOICE coughed from the doorway, and they turned to see Abbot standing there.

"Nice work, Thorne," he commented. "Those transformers cost money, and having a man killed here might cause trouble."

"As much as a day's delay?"

"More." Abbot chuckled. "All right, no talk of money today, then. How's it coming?"

"Most of the new stuff's in. Be ready to make a trial next week," Boyd decided. "And I'm glad you

let me hire Tom, here. He's been doing some fine work, and the men do well under his instructions."

Abbot frowned slightly. "Uh-huh. A week, you say? But— All right, I said I wouldn't say anything about it today, and I won't. There's someone I want to bring out when you go through with it. This . . . person insists on being present."

Meisner glanced at him quickly. "You mean— Maybe it should be. The person might benefit by it, even."

"It's dangerous enough for me alone, without a stranger."

Tom stuck his oar in, shaking his head at Boyd. "It's O. K. I know whom they mean, and I think you should do it, danger or not."

"Anyway, I'm still in charge of the station," Abbot pointed out smoothly. He took Boyd's reluctant consent for granted. "Good, it's settled then. Want to ride in with me, Dr. Meisner?"

"I think so, yes. I'm not needed here. And, Boyd, I shall expect to be present here when already you start the test." Meisner slapped the metal chest and followed Abbot out. Tom and Boyd turned back to the men who were finishing their work.

One of them gestured, and they stopped. "Well, Hennessy?"

Hennessy hesitated, looking uncomfortable. "Some of us are going to town tonight, boss, to take in a show, and we thought . . . well— Want to come with us?"

For once Boyd was glad that his face was expressionless as he looked at the others and saw that they were all in on the invitation. But it wouldn't do to embarrass them in town with his presence, especially now that they had suddenly thawed. "Thanks, boys," he answered. "I appreciate the offer, but there's a full night's work waiting for me.

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There was no look of relief on their faces, as he had expected, but only the look to be found whenever a friendly invitation is turned down for good reasons. "Any idea what happened?" he asked Tom as they moved away.

"A little. For one thing, you saved Hennessy, when they couldn't, at some risk to yourself. They heard dad say you could be killed. Men are funny, that way; they're just selfish enough to dislike anyone who can't be hurt because they'd like that ability themselves and can't get it. Now, because you stand about as good a chance of getting killed as they do, they're back on even footing with you."

Whatever the reason, it would be a blessing to work with them as a man again, even though their social life was in another world. Boyd had a mental picture of himself at a show, and it didn't appeal to him. Companionship, even when offered, was impossible for him.

VI.

THERE WAS a hint of snow in the air, and the temperature outside was so low that Boyd had been forced to wear heavy rubbers to keep the dampness from getting onto his feet and freezing the joints stiff. He clumped around in them now, thoroughly enjoying the ribbing the men were giving him about catching pneumonia. They had loosened up remarkably in the last week.

Now preparations for the test were complete, and they were waiting for Abbot and Meisner to arrive before starting. Tom was still begging to go in with him while the test was run, but Boyd was firm.

"No soap, Tom. Having this

whosit of Abbot's is bad enough. I wanted to take the risk alone, since I could probably stand another explosion fairly well, but I don't want three in there. You'd be needed anyway to build me a new body if this one gets wrecked." He wiggled his shoulders uncomfortably and scratched at his back. "Darn it, there's a place on my back that itches."

Tom grinned, then saw that he was serious. "How could it?"

"I don't know, but it does. Every time I get cold, it itches. You must have put a defective thermostat in there, or gotten some nerves mixed up." He tapped his back sharply. "There, that does it. A light blow works sometimes."

"I'll have a look at you later when dad's around," Tom offered. "Maybe I'd better increase your foot heaters at the same time. Anyhow, it's a good thing we fixed it so you had electrical heat over your whole body if you insist on running around in the cold. Otherwise, your lubrication might stiffen up."

Boyd grunted, looking down the road. "Here comes Abbot, and your father must be with him—there are two in front, and it looks a little like someone behind. I'd rather not talk to them now, Tom, so I'm going inside, and you meet them. Send in whosit, if Abbot still insists. By the way, is he dry behind the ears yet?"

"Partly. Had a little science in college and been studying since, but it's mostly just scientific curiosity. You'll have no trouble, though." Tom grinned at him, but Boyd could see nothing funny as he went into the experimental building. Even a well trained helper might be a nuisance, and sending in a greenhorn was as idiotic a thing as he could think of.

He couldn't help thinking of another person filled with an incessant craving to know. Work and the need of relearning himself had filled his time until Joan had been pushed into the background, but now her image came surging up, bringing futile longings to his mind. Always in the background, he had missed her prying eyes and bubbling saucy grin. But they still told him that Joan was sick, too sick to see him. That was probably an excuse to spare his feelings.

Love, he supposed, was gone, since that was basically a physical sensation, but respect, fondness, and desire for her company persisted. He needed her now, more than ever.

Meisner had been right; he did think too much of himself and his own differences. Life to him was a serious thing at best, and in his new body it had assumed a tragic mood. He knew it, but with the queer twist of his brain, the knowledge only made it worse. He needed someone to laugh at him, to love him, and to show him the gaiety and humor that lay all about him, someone like Joan who could lend him her eyes and let him forget his own brooding.

To a lesser extent, Allan Moss had done the same, and he was another that Boyd missed. The old physicist's theories and plans were familiar to him now, but he still would have welcomed the firm guidance of the scientist, now more than ever. Instead of that, they were sending a science bug to add to his troubles.

THEN a metallic clanking behind him broke through his thoughts, and he swung quickly away from the control panel toward the door. Cold wonder caught at him as he saw the creature moving toward

him. It was larger than a man, its shiny metal body topped by a head without either chin, neck, or face, save for tubes to serve as eyes. In every line and pattern, it might have been a mirror image of himself!

The figure moved forward calmly, holding out a hand. "Tom Meisner told me you were all ready to begin. It's good to see you, Thorne!"

Thorne! Boyd groped numbly, hunting some streak of light. Only Moss and a few others had used his first name, and now— It had to be Moss! If he had escaped, the physicist might have also, though in little better shape. Since it had apparently taken long to recuperate and relearn, he must have been even worse hit. And Abbot had made them say he was dead so that Boyd would be willing to rush things through before the other could come out. That made sense.

He stretched out a metal hand quickly, feeling confidence again for the first time since his return to the station. "And I can't say how glad I am to see you, sir. I've been trying to carry on, but you're needed here. Want to take over?"

A funny choking sound came from the other. "I'm afraid you'll have to do it all this time, Thorne. I'm not . . . I won't be much help to you. Any idea of what caused the failure before?"

"Some idea," he said doubtfully, taking the control seat and pulling out the chair for the other. Obviously, Moss hadn't entirely recovered from the shock, but his mere presence helped. "It doesn't entirely suit me, and I'd rather not mention it until I find out whether it was purely mechanical defects that caused the field to collapse. Ready?"

"Ready."

Boyd closed the switches and watched power drain into the big shell, his eyes glued to the indicators that shifted erratically before he could balance them accurately. Then they found their marks and held. Nothing seemed wrong there. One second went by, then others followed it. He counted slowly to fifty, and still there was no sign of failure. The power needle that indicated energy release within the shell quivered, and began to climb, and all was still in balance. Boyd settled back somewhat, relief spreading through his mind. It was working.

Pop! A thin red light cut on quickly and the needles quivered suddenly, crazily. He tensed himself for movement, wondering whether he could make the switch in time, and looked down. His hand was resting quietly on the switch and every needle was dead! His new arm had moved before the thought was more than beginning in his mind.

Quick reactions and no damage! That had been the trouble before; the ordinary motor impulse had traveled along Moss' arm at a comparatively slow speed, in common with all neural impulses, and things had happened before he could reach the switch. But Boyd's nerves were filaments of silver and the electrical impulse traveled down them with the speed of light, while the muscle packs threw the hand forward faster than the eye could see, before the field had entirely failed.

His companion stirred uneasily. "Is it over?"

"That test is, and a failure. Thank Heaven, not a fatal one, this time." He gathered up the kit of high-tension testing meters they used and moved from the control

seat toward the shell. Now he was more than willing to have the other here. Of all the men he could have chosen for a helper, Moss in his new body alone had reaction time quick enough for the work.

"You'll have to watch the board, sir," he said. "It's in balance now, so just throw the switch on when I signal, and keep your eyes glued on the panel. If a red light comes on or the needles bob, cut it off. You'll be able to do it in time."

He set up the meters quickly, cutting in through the insulation around the transformers and the box to the shell. At his motion, the switch was thrown, and his pointers began pouring out their messages, registering the surprisingly delicate balance of current on his dials. Then, while he was still analyzing them, they went dead.

"Failure again," the other reported. "Find out what the trouble was?"

Boyd assorted the results in his head until the jig-saw pattern shaped up. "Yes. It's simple enough, at that, though we'd never have guessed it, at first, because of that simplicity. Back E. M. F. of a sort, you might say. When power starts feeding in, it induces a back pressure in our field coils, like the back current generated in a running electric motor. That current gets into the transformers and throws the balance of power feeding into the field off kilter, with the results we've seen. I think I know where the trouble starts."

"But can we fix it today?"

"Why not? I suspected it, and there's everything here to work with. We can do it together in half an hour and not bother the men." It was strange to be explaining things to Moss and be giv-

ing orders, but the other seemed to expect it. Boyd motioned as the robot came down. "We'll yank this section of the shell out. If my idea works, we can shunt it around harmlessly."

Again he was thankful for the presence of his companion. Mechanical bodies, he was finding, had very definite points of superiority. They had prevented disaster twice already, and now they promised to save the necessity of making room for a crew of men and machines that would have been needed for the job. Even with Moss' odd hesitation and uncertainty, sheer brute force, coupled with good mental co-ordination, could do wonders.

THE HALF HOUR was only slightly past when he pulled the control chair up and cut the switch in again. There was the usual lag, and then the power needle began climbing, took a sudden lurch, and settled down at the highest mark on the dial. There was a smooth high drone in the air that continued minute after minute, spelling out power in unbelievable quantities and fully under control.

"O. K., sir," Boyd said finally. "We've done it, and I'm glad you were where you could see it."

The other figure stirred uncomfortably, then looked up at him with a sound that held amusement. "Are you, Pickleface? You didn't seem to want me where I could see it before."

Something that should have been the pit of Boyd's stomach went numb, and his eyes shifted erratically out of focus. Gulping sounds came from his vocal apparatus, but they made no sense. Why should they? There was no sense left in the world itself.

Something that approximated a soft laugh came from the other. "Dad told me I wasn't to let you know until after the experiment and warned me you might think I was Dr. Moss. You should have heard the fight I put up to get here!" Again she giggled. "Poor old Pickleface. Don't you like me, now that I'm hairless and ugly?"

"Joan!" The numbness left him in a rush, and he dived for her, only to realize what the loss of lips meant. "Joan, you crazy little fool! So that's what I heard before the explosion?"

Her voice was flat, as usual, but he sensed mockery and guilt in her words. "Hm-m-m. I sneaked in and hid before it began, behind the transformer bank. That's what saved me, I guess. From what they told me, we landed not three feet apart, though I didn't come to until I was in City Hospital. Father thought that if you had a chance at life, I should have the same. Mad at me, Thorne?"

Even without lips, he showed her he wasn't.

Later, when some of the shouting was over and Abbot had gone in to stand over the big shell and gaze fondly at the power indicator, they found Meisner alone in the office. The doctor made room for the two big bodies, grinning at them paternally.

"So it's married my model patient and my not-so-model one shall be, eh? Abbot has told me already."

Boyd relaxed on the seat, realizing that his mind had refused to rest and be peaceful for months. It was almost a novelty. "Married we shall," he answered, "though I suppose it's mostly a formality with us. Funny thing, Abbot seems will-

ing enough now, for some reason."

"That isn't so funny, is it, Papa Meisner? Dr. Moss left you his interests in this, and you're almost rich now. Anyway, just picture poor dad trying to get anyone else to marry me now!" Joan twisted one of his big fingers possessively. "This time, Mr. Thorne Boyd, there'll be no convenient accidents to save you. I won't let you out of my sight until it's over."

Meisner patted Boyd's metal chest. "Me, I think I shall also see there are no more delays. So. And be maybe your best man. Life is not so bad, eh?"

"With twenty-four hours a day for years and years together and never a gray hair or a wrinkle?" Joan kicked her heels together and giggled. "Even Pickleface should be happy now."

The change had made no difference in her, Boyd thought, wondering when she would tire of the nickname; if she kept using it, he'd learn to like it yet. No, life wasn't so bad. There was work for him now, with men who respected him, a rough friendship with Meisner and Tom, and most important of all, companionship with his own kind.

"I'm growing rather attached to this body," he admitted. "Except for one thing. I can't smoke. A cigarette is too small for my air vents, and any holder I've tried is liable to get stuck in them or else it scratches some of the filters off. If I hold it in front, I get just enough nicotine to tantalize me. Think you can fix it?"

Meisner chuckled and winked at Joan. "Never satisfied, this man of yours, I think. Well, we can fix that, maybe." He held out a silvered case. "Try a cigar."

Boyd grunted. He hadn't thought of that!

ADMIRAL'S INSPECTION

by MALCOLM JAMESON



ADMIRAL'S INSPECTION

By Malcolm Jameson

It was a new trick from ancient history—the Admiral's Inspection. But man, what an inspection that turned out to be!

Illustrated by Hubert Rogers

"How about a snappy round of meteor ball before we eat?"

"You know me," grinned Kingman, the torpedo officer, from the cushions of the transom.

"Swell," said Fraser, gathering up the cards from his solitaire game. Fraser had charge of the auxiliaries and the mercury vapor boilers.

"How about you, Bullard?" Lieutenant Bullard was the latest comer to the *Pollux*. He had belonged to the mess too short a time for the others to learn much about him.

"Why, sure," said Bullard. He slid a marker into his book—"Hints on Ship-control, Star-class Cruisers"—and laid the volume carefully to one side. "Only I didn't know—" he hesitated, glancing in the direction of the executive officer seated in a wicker chair in a corner of the wardroom.

"In the *Pollux*, Bullard," spoke up the exec—Commander Beckley—"keeping fit is as important as anything else you do. If you're inclined to split hairs over the regulations, I'll ease your mind on that score. You are *detailed* to play. That makes it official."

Bullard reddened slightly at the implication he might be a sky lawyer, the bane of ships from time immemorial. But Commander Beckley was smiling pleasantly. He did

not mean it that way; he was employing his own method of initiating his newest officer into the usage of the ship. It was true that officers were not supposed to leave a ship while under way, but notwithstanding the regulations, Beckley saw no good reason for making them forgo their daily exercise. The *Pollux* was swinging lazily in a wide orbit about the Jovian System, her electronic blasts cold and dark, patrolling for routine traffic-control purposes. Forbidding men to go over the side was as senseless a restriction as to prohibit swimming from an anchored ship.

"I think some exercise would do me good, too," yawned Chinnery, chief engineer, stretching languidly. "Count me in."

Chief Watch Officer Moore, who had proposed the game, frowned slightly. That upset the balance; five made unequal teams and there was no one else free. He turned toward the exec with a question on his lips, but Beckley had leaned over and was clicking the intership phone, calling Central Control.

"CC? Put the O. D. on. Carlson? A little game of meteor ball is starting. They need a sixth. You're it. Climb into your suit and report to Mr. Moore on the port boat deck. I'll take over for the duration."

The phone was slammed down with a click. The exec looked up. "You had a question, Moore?"

"Why, no, sir. That is, thank you, sir."

"Half an hour," smiled the exec as he rose to go to Central Control to relieve Carlson.

Bullard glowed inwardly. What a ship! No wonder she was regarded as the happiest home in the sky fleet. Clean, taut as a bowstring, yet friendly. From what he had seen, officers and crew were like one big family. The discipline was excellent—but invisible. One could almost term it voluntary. In the few days he had been aboard, Bullard already sensed the difference between the spirit exhibited on this snappy cruiser of the first line and that on the obsolescent reserve mine-layer he had just left, but it took this incident to make him understand why. It was the difference in the personalities of those in control of the two ships.

He had no regrets now for leaving the old *Asia*, even if he had been chief engineer of her and here he was only a junior officer. As he recalled her meddlesome, old-womanish captain and the endless bickerings of the wardroom, he was aware he was glad to be well out of her. In contrast, the *Pollux* had Captain Mike Dongan, aloof and reserved, but capable and invariably pleasant; her exec, despite his air of geniality, held the ship to strict standards of performance; her wardroom officers, for all their pose of flippant indifference, were conscientious in the performance of their duties; her crew, in consequence, were fiercely loyal. All that together made for that prime essential of a "good" ship—esprit de corps—something a man could work for, fight for, die for. There was a new lilt in Bullard's stride as he hur-

ried down the passage to shift into a lightweight spacesuit for the game.

He made his way to the boat deck, and as he stepped out of the air lock onto the broad fin he was impressed by the size of the huge vessel. Its hull sloped upward and away from him, gray in the dim light of a dwindled sun, and he saw for the first time, the row of alcoves let into the ship's side that sheltered the boats. Those, he knew, were used for the reconnaissance of asteroids or areas too rugged to put the ship down on, or for minor searches, or for rescue expeditions. Star-class cruisers, being designed for all-planet service, were equipped with vertical and horizontal fins to stabilize them when easing into an atmosphere, and the horizontal ones made ideal landing decks for their boats.

Bullard saw that the other players were already gathered at the extreme edge of the fin and behind them two diminutive Ganymedian messboys were struggling with the squat sports-howitzer. As he made his way toward them they fired the first of the two low-velocity luciferin bombs, and in a moment, the two shells bloomed into pale green stars, several miles apart and several miles away—the goals for the game. By the time he had joined Fraser and Kingman on the right, the messboys were loading the mesothorium-coated ball into the howitzer. The game was ready to start.

At a signal from Moore, one of the Ganymedians yanked the lanyard and the glowing ball was hurled out into space, squarely between the goals. In the same moment the six players took off, soaring in swift pursuit behind it, belching thin threads of fire behind them. Ten seconds later the sky to port and above was a maze of streaking, interlacing

flames as the players zigzagged to and fro, intent on getting a grip on the ball long enough to propel it toward one or the other of the slowly receding goals.

Commander Beckley watched the fiery skylarking with keen interest. Meteor ball, he thought, as he gazed into the visiplat in CC, was the ideal game for skymen. It was good for the muscles, for although the player had no weight to speak of, he was compelled to put himself through continuous contortions in order to manipulate the flexible, bucking rocket nozzle and still keep an arm free to fend off tackling opponents or to bat the ball along. But far more beneficial was the ingrained sense of tridimensional orientation the game developed, and the capacity to appraise the reaction from the hand-jet impulses. That sense of action and reaction in time, became almost instinctive, giving the player that quality so indispensable in the handling of spaceships—that elusive thing known as the *feel* of a ship. A man possessing that could, in a pinch, handle his vessel blindfolded or without instruments.

Twice Beckley watched a thin line of flame lash through the cool green blaze of the luciferin goal marker, other lightninglike flashes hard behind. That meant that one of the teams had scored twice—clever work for so short a time. And it was unusual, for although the Polliwogs had many good players, they lacked brilliant ones. Beckley correctly surmised that it must have been Bullard who scored the goals, the two officer-teams were too evenly matched otherwise.

He chuckled as he suddenly realized that now the Polliwogs might snatch another trophy from the Castor Beans, their traditional rivals on the sister cruiser *Castor*. He reached

for the long-range televise transmitter on the impulse to call Warlock on the instant and challenge his gang to a game the very next time the two ships fell in together, but as he turned away from the visiplat he noticed the men in the control room silently stiffening to attention. The captain had come in.

Beckley was astonished at the gravity of the skipper's expression, for so far as he knew, all was serene. But at first the captain said nothing. He merely looked thoughtfully about the control room and, seeing his exec in charge and no officer of the deck, he glanced at the visiplat.

"Sound recall," said Captain Mike. "Then read this."

AT A NOD from the exec, the man on the signal board closed a key. The wailing buzz it set up in the helmets of the officers flitting about outside would inform them they were wanted on board with all dispatch. Commander Beckley took the proffered signal from the captain's hand and glanced through it, noticing that as he did, Captain Mike was watching him stolidly, giving no hint of what was in his own mind.

"Yes, I saw this," said Beckley. "What is it, a joke?"

"Joke!" snorted the captain. "Apparently you have not heard of the outcome of the *Canopus*' inspection. Do you realize that Joey Dill has been relieved of his command and stuck in the dark on Uranus for a five-year hitch as commandant of that flea-bitten outpost? That every one of his officers is awaiting court-martial on charges ranging from 'gross inefficiency' to 'culpable negligence'? That the *Canopus*, herself, is practically a wreck and has been ordered to the sky yard on Mars for survey and wholesale repairs? There is nothing funny about



The light gravity made working about the huge rocket tubes somewhat easier—

that. And now it appears we are next."

Commander Beckley stared again at the innocuous-looking message in his hand. It still looked like a prank fathered by someone on the admiral's staff. It read:

From Commander Jovian Patrol to CO Pollux.

You will be in readiness for General Efficiency Inspection 1400 SST 14 May 3940 Terrestrial Year. Entire personnel Castor will inspect in accordance with Archive Reprint USN-1946-FT-53.

ABERCROMBIE.

"Unless I'm crazy—and I won't admit it," said Beckley slowly, "this says that we will be inspected by the crew of the *Castor*."

"Yes." The captain's eye was gleaming.

"And if that is not joke enough, it goes on to say that they will do it according to some aboriginal practice or other. Shades of Hanno and Nelson! What did they ever do on a trireme that is applicable to us?"

"The principles of warfare change very little through the millennia," remarked Captain Mike, dryly, "and, moreover, your history is a bit foggy, Beckley. The Phoenicians much antedated the Americans. The latter were far more advanced. As a matter of fact, they are credited with the invention of the first spaceship. In any case, our admiralty commission, that has been digging through the records unearthed in the excavations for the fifth sublevel at Washington, has decided that some of their practices were good enough to be reinstated. So there we are."

"Meaning, I take it, that we are to be inspected according to some system invented by John Paul Jones, Sims, Leahy, or some other long-dead old sea dog?" Beckley was thankful he had remembered the names of a few of the early Terres-

trials. It was a polite rebuttal of the skipper's comment on his historical knowledge.

"Exactly."

"All right," said the executive officer. "In that case, I will get ready. In fact, we're ready now. You know inspections never gave us any worry."

"We've never been really inspected before," was the captain's grim retort. "Step down to my cabin and I will give you a copy of that reprint."

ORDINARILY, the commander would have greeted the returning ball players with some jolly pleasantry, but although he saw them trooping in, gay and ruddy from their brisk work-out and the bracing showers after it, he said not a word to them. He was deep in the perusal of the antique document exhumed from the vaults below the old city of Washington. The deeper he read, the faster his confidence in the ship's readiness oozed away. At first he had some difficulty with the outmoded terminology, but as he groped his way through it, glimmerings of the immense difficulties before him began to appear.

In the end, he sat in astounded admiration at the ingenuity of a people he had long thoughtlessly regarded as primitive. Small wonder their ships had behaved so well during the great Terminal War of the Twentieth Century. The marvelous stamina they displayed was due to the fact they were prepared—prepared for anything, whether accident, damage in action, or catastrophe of nature. So long as any craft of that age remained afloat, its crew continued to work it and to fight it. And now he had learned why. *They knew their stuff.* The

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system they followed forced them to. Hence, the admiralty's recent adoption of that system.

Beckley sat through supper very quiet and seemingly morose. He was engaged in appraising himself—Chinnery, Moore, Fraser, and the rest. How good were they, for all the trophies they had won? He remembered wryly, how they won first place in the acceleration contest. He and Chinnery knew that the circuit-breakers were lashed down and every fuse in the ship jumped by heavy copper cable. He and the surgeon knew how heavily the men had been doped with *gravonol*. It had taken four days of special rigging to accomplish that feat. Highly artificial! Bah! It was an empty triumph, now that he thought of it honestly in the light of what he had been reading.

After supper, over the cigars, he attempted to convey to his juniors, some of what he had just learned and what was ahead of them. It was not easy. The *Pollux* had for a long time been considered a model ship and it was the conviction of most of her officers and practically all her crew, that she could do anything any other ship could do and do it quicker and more smoothly than any other afloat in the ether.

"So what?" demanded Chinnery, as soon as he learned that for the duration of the tests, Pete Roswell of the *Castor*, would be at his elbow, watching and noting everything he did, and that rating for rating, every man in the black gang would be matched by his opposite number from the sister cruiser. "Let 'em come. Let 'em watch. They'll learn something. Who cares what they see? My uranium consumption, acceleration for acceleration, is the lowest in the whole star-spangled fleet. We haven't had a breakdown

of an auxiliary in more than a year, and that's a record for any man's service."

"That is just it," observed Beckley pointedly. "You're *too* good. It makes you cocky and you take too much for granted. What would you do if you did have a breakdown—cut in your reserve generators, I suppose?"

"Sure—always have. They work, too. Both sets."

"And if those went on the blink?"

"Well—there are the selenium units on the hull, only—"

"Quite so. Only there isn't much sun power out here by Jupiter and you haven't run a test on them since we left Venutian Station. But suppose you did hook 'em up and could get a little juice out of them and then *they* went out, what?"

"For the love of— Why, storage batteries, of course."

"Storage batteries' is good," snapped the exec. "In the last quarterly report, if my memory is correct, they were listed as being in 404D, your space storeroom. How many amps do you think you could pull from there?"

Chinnery lapsed into a glum silence. He had never seen the exec in this mood. Beckley turned to Fraser and asked abruptly:

"What do we do if the intership phone goes out?"

"Shift to telescribes."

"And after that?"

"The annunciator and telegraph system."

"And after that?"

Fraser looked puzzled. "If we lose the juice on the annunciators they can be operated by hand." He shrugged. "After that, if you insist on it, there are always messengers."

"Why not voice tubes?" queried

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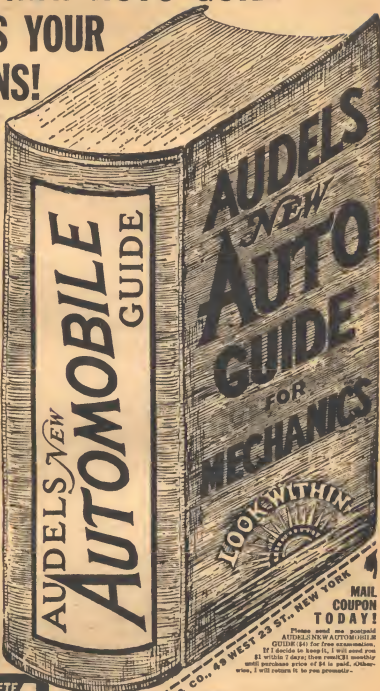
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JACK No. 11

Beckley, cocking an eyebrow.

"Voice tubes?" echoed several. The others laughed. The admiralty had gone primitive.

"That is what I said. Believe it or not, gentlemen, but the *Pollux* is equipped with a complete system of voice tubes, gas-tight covers, and all. Yet not one of you knows it. You have probably painted them over, or stuffed them with old socks or love letters. Now get out of here, all of you, and inspect your parts of the ship. Come back at midnight and I will tell you more about this inspection and what we have to do to get ready for it."

THE group of officers returned to the wardroom at twelve, not greatly enlightened by their inspection. They knew what the commander was driving at, but most of them felt they already knew the answers. On a warship there are always many alternative ways of doing the same thing, for in the heat of action things go wrong and there is no time for repairs. But most of them were already familiar with what they had to deal with, except Bullard, of course, who was new. He was the only one of them who had the slightest doubt of his readiness for any test that might be put to him.

Cracking jokes, but at the same time slightly mystified by the slant the executive had taken, they assembled. Commander Beckley entered and tossed the reprinted early-American document on the wardroom table. Moore crossed the room and fingered it, noting its title. It was "Chief Umpire's Report, Battle Efficiency Inspection U. S. S. *Alaska*, Spring, 1946."

"I have told you we are to be inspected by the *Castor*," began Beckley. "What I didn't tell you is that later on, we inspect them."

"Wheel!" yelled Fraser. "I've always wanted to know how they put-tied up that main condenser. It is nothing short of a miracle how it hangs together."

A look of smug satisfaction flitted across Chinnery's face. In his estimation, Pete Roswell, engineer of the *Castor*, was a stuffed shirt.

Moore was smiling, too, the contented smile of a cat contemplating a canary. Freddy McCaskey, navigator and senior watch of the rival ship, was also his rival for the hand of a certain young lady residing in Ursapolis. His brilliant take-offs and landings in the skyport there had long annoyed Moore, for Moore knew, even if the admiral did not, that they were made possible by certain nonreg gadgets bolted to the underside of the *Castor's* chart rack. They were nonreg for the reason that they were unreliable—they could not be counted upon to stand up under the shock of action. Moore itched to be in a position officially, to expose them, and by doing it burst the bubble of McCaskey's vaunted superiority as a ship handler.

There were others present who had similar designs calculated to upset the peace of mind and complacency of their friendly enemies, judging by the ripple of anticipatory grins that swept the room.

Beckley's eye roved the group, missing the reaction of no one.

"Ah," he breathed, "so that's the way you feel? Well, let me tell you this—so do the *Castor* Beans. And don't ever forget, they inspect us first."

"But don't misunderstand me. There will be no cutthroat competition about this. Friendly rivalry, such as we enjoy with the *Castor*, or outright malice, if it were present, makes very little difference. The men from the *Castor* do not in-

spect us in the sense of passing judgment; they merely observe and record the data. It is the admiral who does the judging. But you can bet your bottom dollar they won't miss anything. They live and work in a ship the exact twin of ours, and they follow the same routine. They know our weak spots and how we go about covering them up, for they have the same spots and, I dare say, use the same tricks. We might fool the old man, but never a *Castor* Bean.

"As I said before, they will all be here, from Captain Allyn down to the landsman for cook's helper, and every man jack of them will have a stop watch and a notebook. We will be covered, station for station, all over the ship.

"Leaving out the preliminaries, such as looking at the bright work and haircuts and all that sort of thing—which worries none of us—the first thing that happens to us will be the emergency drills. Those are going to be different. The American doctrine was that the real test of an emergency organization is an emergency, and one peculiarity of emergencies is that they come when you least expect them. Moreover, the people on watch at the time are the ones who will have to handle them. That means we cannot hand-pick our best and most experienced men to do the drilling.

"IT WILL BE worked this way. The admiral will ask to see our watch list. He'll run down through the names and pick one at random. It might even be Bullard, here—"

Bullard winced. He did not like that "even," though he was only three days in the ship.

"And he will say, 'Send Lieutenant Bullard in.' Bullard will have to relieve the deck. We may cruise

along an hour after that, not knowing what is coming, when suddenly the chief umpire will announce, 'Fire in the lower magazine,' or 'Penetrating collision,' or whatever emergency they have picked. Every *Castor* man starts his stop watch, licks his pencil, and looks at the man he's umpiring. The test will be not only of Bullard, but of the whole organization. As for Bullard, he is in sole charge, and neither Captain Dongan nor I can advise him, and the rest of you can only execute what orders he gives. Whatever he does, whether the right thing, or the wrong thing, or nothing at all, goes down in the notebooks, and also the manner of its execution.

"Let us say the conditions announced are that a small meteorite has penetrated the collision bulkheads and padding and has come into the crew's quarters. We are in ordinary cruising condition—that, is, without spacesuits on. Were our interior gastight doors closed and dogged? If they were not, we lose air throughout the ship. Bullard, no doubt, would order a repair party forward. The *Castor's* repair party will go through the intermediate lock with our party, noting everything. Did the lock work smoothly? What kind of patch did the repair party put on, and how long did it take? Were they skillful or clumsy? How long after that before air was back in the compartment? Did the patch leak? How much elapsed time between the alarm and 'secure'?"

"You get an idea from that, of how closely we will be supervised. I need not go into all the other emergency drills, or the possible variations on them. The point to engrave in your memories, is that any of you may be called upon to conduct them, and without prior notice. You had better know the answers."

"I think we do," remarked Moore, looking about at the others.

"Those tests are comparatively trifling," pursued Commander Beckley. "It is the battle drills that are apt to give us trouble. There they will spring casualties on us."

"Casualties?"

"Yes—imaginary accidents, failures of equipment, fatalities. In battle, you know, things happen. We bump into mines. Torpedoes hit us, and shells. We overload motors and they burn up. Controls get jammed. People get hurt and drop out of the picture and somebody else has to step into their shoes and carry on. Our thermoscopes may go dead. A thousand things can go wrong. The big question is, what do we do when they do?"

"Captain Allyn and his officers will work out a schedule of such casualties, neatly timed, and shoot them at us, one by one. As they do, they will make it as realistic as possible. If the primary lighting system is declared out of order, they will pull the switches. If the phones go out, they will jerk the connections in Central, and we can't touch them. If gas is reported in some compartment, they will let loose some gas in there. You can expect those casualties to come thick and fast, and you will have to know your switchboards and pipe manifolds from A to Z. It will test your versatility and coolness to the utmost."

"They ought to be able to think up some good ones," drawled Chinnery, and a few of the others laughed. The *Castor* had stripped the blades in her main auxiliary turbine only six months earlier, and she had had a serious switchboard fire during her last battle practice. Not only that, but in a recent take-off, a jet-deflector had jammed and she had spun for more than fifteen minutes

about eight miles above Europa City, a gigantic pin wheel, spewing blue fire. That brought her a biting rebuke from the Patrol Force Commander.

"They will," said Beckley, grimly.

There was some laughter, but there was a hint of uneasiness in some of it. Ever since the exec's crack about voice tubes, their complacency had waned. To their surprise, the voice tubes were found to be there. What else was there about the ship they did not know?

"I think that covers it," said Commander Beckley, rising. "That is, all but one feature—human casualties. It appears from this"—and he tapped the Archive Reprint—"that it was considered a rare bit of humor by our lusty ancestors to kill off the skipper early in the game, and they usually followed that promptly with the disposition of the executive officer. In this report, they killed off practically all their officers in the first five minutes, and a great many of the crew with them."

"The moment an umpire declares us dead we cannot utter another word, no matter what happens. Our organization has to carry on without us. That may be a good test, but I fancy it is agonizing to watch. I recommend you put a little more attention into your drills hereafter. But above all, each of you must be prepared on an instant's notice, to succeed to the command of the ship as a whole."

"By the time we get it," observed Kingman, anxiously, "she will be virtually a wreck—riddled with imaginary holes, on fire, lights out, generators dead, controls jammed, two thirds of the crew knocked out and—"

"You get it," grinned Beckley, relaxing for the first time since the captain had interrupted the meteor

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ball game. "Good night, boys—pleasant dreams!"

"DON'T you worry, Mr. Bullard," said Tobelman, his chief turret captain, after General Quarters the next morning. "There isn't anything in this turret we can't handle, somehow."

But Bullard did worry, for he knew he was green. But he worried with a purpose. Every day of the three weeks that intervened between the exec's warning and the time set for the inspection, he plugged away at learning the ship and its intricate mechanism. By day he crawled through access and escape hatches, tracing cables and conduits; at night he pored over wiring diagrams and pipe layouts. He learned how to break down and assemble the breech mechanisms of his guns, how to train the turret by hand, and how to load in the dark. He became acquainted with the use of his stand-by thermoscope and practiced for an hour each day on the old Mark XII Plotter installed in his control booth, so as to be able to maintain his own fire should his communication with the CC be cut off.

In like manner he checked his "ready" magazines and found out what he needed to know about their sprinkler systems and smothering-gas ducts. He went on beyond them and made himself familiar with the reserve magazines with their stores of TNT, ammonium nitrate, and bins of powdered aluminum. His *ammonal* he did not mix until needed, a precaution to reduce the fire hazard.

By the end of the second week he had gained a sense of confidence. In his own little department, at least, he knew his way around. And the more he worked with Tomlinson, the more he realized that back of him was a splendid bunch of boys. What he couldn't do, they would. It was in his capacity as officer of the deck

that he had the most misgivings. As a watch officer, he took his regular turn in supreme command of the ship, and the more he prowled its recesses the more he was impressed by the magnitude of the task he had set himself—to learn *all* about the ship.

Every cubic yard of her vast bulk contained some machine or electrical device, the use of many of which he had but the vaguest knowledge. The *Pollux* was a very different breed of ship than the old *Asia*, relic of the Third Martian War and long overdue for the scrap heap.

On the *Asia* he had been chief engineer, and as such, knew every trick of the balky old tub, yet when he would go into the engineering compartments of the *Pollux*, he stood humble before its glittering intricacies, almost dazed by the array of strange equipment. They showed him the clustered nest of paraboloid propelling reflectors, together with their cyclotronic exciters. They traced for him the slender tubes that conveyed the pulverized Uranium 235 to the focal disintegrating points, and explained how to operate the liquid hydrogen quenching sprays. Fraser took him through the boiler rooms and sketched out for him the cycle of heat transfer, beginning with the qucerly designed atomic power fire boxes, and ending with the condensers outside on the hull. Elsewhere, he examined the mercury vapor turbines and the monstrous generators they drove. In all that vast department there was but one section that struck a familiar chord. And it, he discovered, was kept locked off.

"Oh, that?" sneered Chinnery, when Bullard tapped the sealed door. "A set of old oxy-hydrogen propelling motors. Stand-by, you know. Some dodo in the admiralty drafting room is responsible for that, I guess

—supposed to be used when we are *in extremis*."

Chinnery gave a short laugh and turned away, but Bullard was persistent. He wanted to see them and check their fuel leads. At least, he had found something in this ultra-engine room he could understand at a glance.

"I forgot you came from the Crab Fleet," said Chinnery, in mock apology, "but since you ask it, you shall see those noble engines," and Chinnery beckoned to a rocketman, first-class, who stood nearby.

"Show Mr. Bullard the skeleton in our closet," said Chinnery, and departed, his spotless dungarees a mute reproach to Bullard's own grease-smeared overalls.

"I was Crab-Fleet, too," grinned Benton, the rocketman, as he forced the door. "They don't think much on these Star-ships of the old liquid-fuel tubes, but you and I know what they can do. At least, you can count on 'em. These atom busters are O. K. when they work, but they're too temperamental to suit me. But you're the first officer I ever saw in the *Pollux* that even wanted to look at them tubes—our oars, Mr. Chinnery calls 'em."

Bullard laughed outright. The Patrol Force was a strange blend of ultramodernism and old customs, a sore of bivalence—where practical men of the old sailorman psychology used every modern gadget and hated it as he used it; and trim, smart scientists applied archaic sea terms to their latest triumphs.

ON ANOTHER DAY Bullard let himself into the big nose "blister," and saw for himself, the arrangement by which the impact of stray cosmic gravel and small mines was distributed and absorbed. Beneath the false bow plate of vanadium steel

was a roomy forepeak stuffed with steel wool, and scattered irregularly throughout were other loosely connected plates separated by sets of spiral springs. In general, the anti-collision compartment resembled a titanic innerspring mattress laid across the ship's bow. A cosmic lump striking the nose plate could not be prevented from penetrating, but each of the inner bulkheads it pierced gave a little, disturbing the force of the impact and slowing down the celestial missile by a large percentage. Only a massive body moving at relatively high velocity could retain enough velocity to crash through the last bulkhead into the crews' quarters.

Behind the crews' quarters stood the armored bulkhead that shielded the heart of the ship—the colossal triple-gyro stabilizer that formed the nucleus of the egg-shaped spaceship and marked the location of the vessel's center of gravity. It in turn, was supported by a massive steel thrust column, rising directly from the arches that held the propelling motors, and clustered around the thrust column and in the lee of the armored stabilizer housing lay the Central Control Room, Plot, the H.E. magazines, and the more volatile of the chemical stores. Elsewhere in the ship were the various auxiliaries—the air-circulating fans, the renewers, and the garbage converters, and all the rest of the multitudinous motors for every purpose.

Bullard was exhausted, mentally and physically, by the time he had completed the comprehensive survey, but he felt better for having done it. In his journeys he had missed nothing, taking in storerooms as well as machinery spaces, viewing the planetary bombing racks recessed in the landing skids, and the selenium heliogenerators on the upper halves of the

hull. There were many details he knew he had not fully grasped, but the main thing was he had regained his customary self-confidence. He no longer felt himself a stranger on the ship.

The others had not been idle, either. Intensive drills had been held daily in all departments, and as nearly as was humanly possible, every conceivable contingency had been foreseen and provided for.

"If those Castor Beans have thought up just half the stunts I have," observed Kingman, at the end of a strenuous day's preparations, "this inspection is going to be a honey. But what the hell! My conscience don't hurt. If there is anything unprovided for, it's the fault of my lack of imagination—nothing else."

"Yeah," grunted Chinnery. Chinnery had become a trifle touchy over the coming ordeal. The exec had made him clear out the old battery room and reinstall his storage batteries.

"They say," chimed in another, "that Freddie McCaskey is going to make Moore set the ship down on top that spiny ridge at the north end of Io, with two of his underjets out of commission. To make it tough they are going to put an egg on the chart-rack. If it falls off and busts when he hits, the mark will be a swab-o."

"Scuttlebutt, you dope," commented Fraser, "nobody knows what they'll spring on us. But, personally, my money is on the old *Pollux*. All that's worrying me is—"

And on and on it went. Speculations was rife in every nook and cranny of the powerful sky cruiser. The lowest rating on board tossed feverishly in his hammock throughout the rest period called "night," trying to imagine what crazy orders

might be given him, and what he would do about it when he got them. The Polliwogs were agreed on one thing, though. Come what might, the only visible reaction any umpire would get, would be a cheery "Aye, aye, sir." Deadpan compliance was the password. They swore that under no circumstances would any of them display surprise or dismay.

CAME the momentous day. Clean as a shower-washed sky and burnished and polished until she shone almost painful brilliance, the *Pollux* lay proudly in her launching cradle at Ursapolis Yard. To the shrilling of pipes, another vestige of age-old tradition, the spry little admiral clambered aboard, his staff at his heels, for the first stage of the inspection.

His trip through the spotless com-

partments was swift. Although few details of the interior could have escaped his darting glances, he took no notes, nor did he pause at any place to make comment. It was not until he had completed his tour that he broke his silence.

"She *looks* good," he said, cryptically, to Captain Dongan. Whereupon he trotted off to his quarters in the yard for his lunch, sending back word that he would return in two hours for the remainder of the exercises.

"Cinch!" muttered someone, but the captain wheeled and scowled at him. To the captain's mind, the admiral's serene disregard for the snowy whiteness of the paint work was significant. Plainly, the old man's interest was centered elsewhere, and that could only be on the practical tests. It was not that the captain

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was especially dubious as to the outcome—he merely wondered. After all, as he had told Beckley, they had never really been inspected before.

Hardly had the admiral left than the Castor Beans began pouring aboard. The enlisted men came first, swarming down the dock and waving their notebooks.

"Hi-ya, Pollutes!" they yelled. "Boy, if you only knew!" Grinning Polliwogs let them aboard and led them off into the recesses of the ship, hoping, while their umpires were in a boastful mood, to worm some of their secrets from them in advance. A little later Captain Allyn and his officers came, and later, at the appointed hour, the admiral.

"Ahem," announced the admiral, his words very crisp, for all his high-pitched, thin voice. "The *Pollux* will lay a course past Jupiter to the small, innermost satellite, now in opposition. She will land on it, then take off and return to base. During the problem, she shall not communicate with nor receive assistance from the outside. At various times, as we go, we shall hold drills, introducing various casualties. It must be understood that these artificial casualties are to be treated in every respect as if they were real, and if the ship departs in any manner from such treatment, the score for the tests shall be zero."

Captain Dongan acknowledged the admiral's instructions with a nod.

"And let me add," went on the admiral, "that should there, by chance, occur any real accident or casualty, it shall be treated as part of the problem. Are you ready, gentlemen?"

CARLSON, the baby of the mess, drew the take-off, and despite a rather obvious self-consciousness, managed it well. The ship drew upward cleanly and smoothly, and gradually curved like a soaring eagle toward the great rose disk of the System's primary. Carlson drew a

perfunctory, "Well done," from the chief umpire, and withdrew, mopping his brow in relief. It was Kingman who succeeded him.

"Fire in the paint locker!" was what Kingman had to deal with—the commonest and most obvious of fire drills. People ran to their stations in jig time and were duly checked off. Their performance was faultless, their apparatus was in perfect condition, the most carping critic could find nothing to complain of. A great load rolled off the exec's troubled mind. Fire in the paint locker, indeed! If they kept on springing chestnuts like that, this expedition would be a picnic.

"And think of all the useless work he put us to," crabbed Chinnery into Fraser's ear.

It fell to Fraser's lot to conduct the Abandon Ship Drill. The Polliwogs were tense as televox repeaters throughout the ship chanted the call to the boats. No. 3, on the starboard side, was a balky slut. Five times out of six her tube would not fire unless preheated with a blowtorch. It was a mystery why, for they had successively put in four spares and still No. 3 performed in the same erratic manner. But today she took off like a startled dove at the first touch of the coxswain's button. Pure luck that was, for there was not a chance to use the torch with watchful umpires writing down all they saw.

The Castor Beans pawed through the returned boats, looking for error, but their search was unsuccessful. Boat boxes were correct, down to the first aid kit, as was the power installation and the handling. Fraser drew another four-o and was excused.

Bullard was called up and there was a long lull. They were inside Ganymede's orbit before the umpires raised the alarm of collision.

That, too, was expeditiously dealt with, although a penalty of one tenth of a point was assessed because a third-rate carpenter's mate in his haste, entered the air-exhausted compartment before putting his vacuum helmet on. When Bullard heard that that was all that was wrong, he drew a deep breath and relaxed. It was annoying to have sullied the ship's hitherto perfect score with a penalty, but it could well have been worse.

Moore drew the "Search and Rescue Party" and while the ship hove to above Mount Sarpedon in Equatorial Europa, descended into that noisome crater and found and brought back the dummy which an aid of the admiral had planted there some days before. It was a triumph for the *Pollux*, for the dummy was lying smack in the midst of the dreaded Halogen Geysers. Raw flourine is hard on standard equipment, but the *Pollux's* rescue boat carried what it took. Aside from a mild gassing of two members of the boat's crew, there were no mishaps.

The admiral was standing on the boat deck when Moore came back. He stared at the remnants of the corroded dummy and at the pitted helmets and reeking suits of the rescue party. A Castorian umpire stepped out of the boat and reported the two cases of gassing.

"Too nice work to spoil with a penalty," decreed the old man. "Chalk up a four-o for Lieutenant Moore."

That night the mess was jubilant. They were two thirds the way through the inspection and hadn't slipped yet—except for that fractional point against Bullard. No one reproached him for that, for it was not that kind of a mess, but Bullard was none too happy. Had there been other penalties, he would not

have minded, but this one stood glaring in its loneliness.

"We're better than you thought, eh?" said Beckley, slapping Abel Warlock, exec of the *Castor*, on the back.

"You're not out of the woods, yet," was Warlock's dry rejoinder, and he threw a wink to Pete Roswell. "Tomorrow's another day."

It was under the stern and drawing aft when General Quarters was sounded. Men tumbled to their battle stations and manned their weapons. Bullard crawled into his control booth and strapped on his head-*phone*. "Ready," he reported, after an instantaneous check-up of his turret crew. Every man was at his post, poised and ready.

It was a tableau that was repeated all over the ship. Captain Dongan was at Control, the exec in Plot, and on down the line each was where he should be. And beside each was the inevitable umpire with his ticking watch and his telltale notebook. Now was the hour. Here is where the fun began. "Were the Polliwogs fair-weather sailors or what?"

"Start watches," signaled the chief umpire, and the problem was begun.

At four and a half seconds, Bullard let go his first salvo. Swiftly his men threw in the second load.

The machinery-packed turret was uncomfortably full of men, what with the doubling up due to the presence of the umpires. These latter were dancing about, trying to keep out of the way while at the same time recording the fire-control data as it came in over the visuals, or otherwise making notes of the efforts of the *Pollux* men. In the booth with Bullard was Heine Bissel, the turret officer of the *Castor*, keeping one eye on what Bullard was doing and the other peeking at the list of casualties

in his hand. Bullard envied the umpires their freedom of movement, for unlike the men at battle stations, there was no necessity for the umpires to dress themselves in space-suits. In battle, of course, suits were donned before its commencement. A chance hit, penetrating an outer bulkhead, might at any instant cause a compartment to lose its air.

Bullard's second salvo went, but coincidentally with it the lights flickered, dimmed a moment, then blazed up again. Somewhere below something had gone wrong with the primary lighting circuit and there had been a shift made to another.

"Your ammunition hoist motors are inoperative," announced Bissel, looking at his list.

"Hoist by hand!" ordered Bullard, almost in the same breath. He attempted to report the casualty to CC, but the phone was dead on his ears. He snatched its jack from the outlet and plugged in on No. 2 circuit. It was dead.

His men managed to get the guns fired a third time. It was a full three seconds late, due to the delay occasioned by having to serve the guns by hand, but under the circumstances, in good time. Bullard saw them ram the fourth set of projectiles home. His eyes caught the racing words on the telescribe above his head, "Transverse hit penetrated both CC and Plot—captain and executive dead—control now in sub-CC—Chinnery commanding."

"Your lights have gone out," remarked Bissel, with a triumphant gleam in his eye, reaching for the cut-out switch overhead. The lights were out.

Bullard kicked out with his left foot and found the emergency battery switch. Again there was light, this time from the turret's own batteries, independent of any general

ship's circuit. Tobelman shot the propellant into the breech of the last gun and closed the firing key. There was no recoil. He jerked the lanyard and fired the guns by percussion. At that moment an umpire rose from behind the loading tray and fired a pan of flashlight powder. There was an instant's brilliance, blinding in its intensity. Then all was black.

"Your battery has short-circuited," came the calm voice of Bissel through the murk. There was suppressed amusement in it, and Bullard suspected this last casualty was an improvised one. But it did not matter. Bissel had kicked the turret switch open again, and that made it official.

"Loaded in dark, sir!" called Tobelman. "Ready!"

"Fire!" Bullard was proud of his gang.

"Enemy shell just entered and wiped out turret crew," whispered Bissel. There was silence outside the booth as the men desisted from their efforts in the dark. Each had been told the same thing by his own umpire. Bissel snapped on a portable flash long enough to jot down the time of the massacre.

"Am I dead, too?" inquired Bullard.

"Oh, no. You're all right. Your turret is all shot, that's all."

Bullard dived out of the escape hatch. If all his men were dead, there was nothing to be gained by sitting in the darkened control booth waiting for the end. His duty was elsewhere.

THE ELEVATOR was stuck between decks, probably another casualty. Bullard, trailed by the panting Bissel, flung himself down the ladder and dropped through the armored hatchway into CC. It was empty, except for a couple of lounging umpires, comparing notes. Bullard cast



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an anxious eye at the settings on the main control board, but with it saw that the master switch at the top of it was open. Control, of course, had been shifted elsewhere. The positions, of the controls here, regardless of how they were set, were meaningless.

He dashed down the passage toward sub-CC, a little cubbyhole abaft Plot, not wasting a second in a futile stop at the Plotting Room. What he had seen in CC, would doubtless, be repeated there. As he passed the door of the wardroom he caught a glimpse of the officers crowded in there, and what he saw made him pause a moment and take a closer look. Peering through the glassite panel he was astonished to see most of the officers of the *Pollux* in there, either out of their spacesuits or in the act of taking them off. Chinnery, whom he thought in temporary command, was one of them.

"The corpses," grinned Bissel. "They are where they won't interfere and they may as well be comfortable."

But from the indications, Captain Dongan was anything but comfortable. He was pacing the deck impatiently, grave concern in every line of his rugged face. Beckley looked scarcely less uneasy.

Bullard hurried on. He had seen every one of his brother officers in there except Fraser. Could it be that he and Fraser were the only survivors? He jerked the door of sub-CC open. The place was a madhouse, five men stationed at voice tubes yelling to five other men in some other place—and each of the five communications was a different one.

"Thought you were dead," exclaimed Fraser, seeing Bullard come bursting in. "Everything has gone to pot and communications are terrible, but if you are looking for a job, jump down into the engine room and make a check—"

"Apoplexy!" screamed an excited umpire, pointing at Fraser. "You! You're dead."

Fraser choked his words in the middle, stamped a foot in disgust, and jerked off his helmet. He turned in the doorway and looked as if he was about to say something; then, as if thinking better of it, stalked off toward the wardroom to join the rest of the "dead."

Bullard suddenly realized that he was left in command on the ship, but he had not the faintest idea of her running condition beyond knowing from her heave, that she was still accelerating full power. Until he could learn what had happened and what was left in operating condition, he could give no intelligent orders. Then it was that he saw the admiral, Captain Allyn, Commander Warlock and others watching him intently, through the broad deadlight let into the bulkhead between Plot and the sub-CC. So *he* was to be the goat of this inspection! A sorry trick. He, the next most junior officer on the ship and the latest to join her, put to this severe test! It angered him, but the thought as suddenly struck him that the test was also one of the *Pollux*. As long as any man of her complement remained alive, he must carry on. These foxy umpires must be shown that the *Pollux* was prepared, and well prepared. The three tedious weeks of intensive drills and the unceasing labors of the captain and his exec in teaching their men must not be in vain. If the ship still could be handled, he would handle it!

"SILENCE!" he roared. The weary talkers at the voice tubes looked at him and blinked. He flung a finger at the first one. "Report!"

One by one, the five told the story, staccato words coming fast. As the

details appeared, Bullard was aghast at the task set for him. The torpedo room, like the turret, was out of commission, its crew wiped out. There was a fire raging in the chemical stores locker. The great mercury boilers were shut down, their superheaters riddled and leaking, and as a result, all auxiliary power was off. There was only the weak and inadequate current flowing in from the helio units, sufficient only to maintain the standing lights. All means of communication was gone except voice tubes. And to cap the climax, the main jets were said to be jammed—full speed ahead. And ahead, perilously close, lay Jupiter—Jupiter the colossal, the huge, the devouring magnet. Drill or no drill, something must be done, and that very soon.

As Bullard sprang into action, he wondered how long the farce of imaginary disabilities would be kept up. Yet until the war game was called off he could touch none of the umpire-guarded valves or switches. He had to work with the disorganized residuum of the mighty ship's power. A new note of danger began to hum, warning him that whatever he was to do could no longer be postponed. Since the automatic controllers on the uranium feed lines were not operating, the acceleration was slowly picking up—when he wanted none at all he was getting more—and there was no way of cutting it off except manually.

He raised the tube room and found to his immense satisfaction that it was Benton, the rocketman, who was in charge there. Benton assured him there was no way to shut off the uranium flow other than by using the forbidden electrically controlled valves.

"Get pipe cutters, then, or Stilsons, and *break* the lines!"

"Aye, aye, sir."

Bullard knew that Benton knew that the uranium would continue to dribble out, wasting into the wake, but unless it was fed to the exact focus of the disintegrating inferno, it could not flare into the tremendous energy of exploding atoms. Once the supply was cut off, the quenching sprays would make short work of the bits still at the focal points.

An insistent call kept coming from the chemical locker, where the fire was supposed to be. The Polliwog there complained that the umpire would declare him burnt to a crisp unless some action was taken to subdue the fire. For a moment, Bullard hesitated. Actually, there was nothing inflammable in the chemical locker—except the fireworks flare the umpires had set themselves to add realism to their act—and consequently the compartment was not fitted with fire-fighting devices.

"Evacuate the storeroom," ordered Bullard. "Gather up all the *Pollux* men near you and transfer everything in it to the reserve magazine inboard of you."

"Aye, aye, sir," came the voice, relieved from his dilemma of having either to abandon his post or be roasted alive.

Bullard felt the lagging of the vessel as the acceleration ceased and knew that Benton had succeeded in breaking the atomic feed lines. It was a pity to have to waste power in that fashion, but it was unthinkable to continue longer on a power dive into Jupiter. The jet-deflectors were locked rigidly fore and aft and there could be no turning with those jets. He got Benton to the voice tube once more.

"What's wrong with the old rudder flaps over the liquid tube jets?"

"Not a damn thing, sir."

"Then warm up your tubes and let's get going—"

"Aye, aye, sir."

"And, Benton, when they've started spewing, flip 'er halfway around and shoot ninety degrees from the present course. You'll have to do that by local control—there is none for those old tubes in this sub-station."

"Aye, aye, sir."

BULLARD felt better. He was devoutly thankful they had spared Benton for him. Benton was a man of parts. Shortly they would have this wildly careering warship under some degree of control. Then Bullard could proceed with some of the badly needed minor corrections. One thing that was a source of great annoyance was the all-pervading noise, much augmented by the shouts of his voice tube talkers. He decided to abandon the use of the archaic tubes and instead, employ the etherphones in their space helmets. It meant setting up a manifold party line, for the helmet phones were not selective and if everyone should start talking at once the result would be babel.

"Tell all hands," he directed the group of talkers in sub-CC, "to close their face plates and tune in on the etherphone. No one is to speak except in answer to me or to report an exceptional emergency."

The word was passed. Bullard, to check the efficiency of this means of communications, called the various parts of the ship in succession to receive their reports. There were a gratifying number of men still alive and at their posts, despite the wholesale slaughter of the officers. It was not until he checked on the chemical locker fire that he heard anything to disturb him unduly. All was going well until the wild laughter and silly words of the man in charge of the

reserve magazine rang in his helmet. Bullard snapped back harsh questions, and for answer got only maudlin ravings, interspersed with outbursts of giggling. The man was drunk—or something.

Bullard glanced sharply in the direction of the admiral and the knot of inspecting officers watching him from Plot. They, too, showed some signs of glee, several of them grinning vacuously. Pete Roswell was executing an awkward burlesque of the *quilliota*, a rather risqué version of the time-honored muscle dance often seen in the cabarets of Ur-sapolis. A sudden anger surged within Bullard. Had they turned the inspection into an outright farce? A bad joke at his expense? As he stared indignantly at the group in Plot, he was further outraged to see Abel Warlock waggishly begin ripping the meter leads from their terminals. And—of all things—the admiral himself, was capering about madly, an absurd elfin smirk spread across his usually ultradignified features.

Again Bullard sharply challenged his man in the magazine. This time the voice that came back was more sober—almost penitent.

"Sorry, sir—had a crazy dream, I guess. But it was awfully funny, sir." As he talked his voice grew even more sober and more contrite. "And sir, I ought to tell you—the umpires have passed out. They're lying around all over the place—"

A funny dream! Umpires dropping unconscious! Bullard lost not a second. With a bound he left sub-CC, headed for the trunk leading down to the magazines.

He fought his way through the smoke of the flares, passed through the half-emptied chemical locker and into the reserve magazine. Dimly

he saw his magazine keeper bending over several limp forms on the deck. Bullard paused to examine the smoke bomb but was convinced that it was not the cause of what was wrong. It was a standard product—a mixture of luciferin with a little strontium salts, giving at once, a ruddy flame and considerable quantities of smoke, yet without much heat. Its fumes were neither intoxicating nor hypnotic.

He saw that much of the miscellaneous assortment of chemicals that had been stowed in the locker were now standing about the floor of the magazine, but all of them were ordinary substances and not regarded as hazardous. There were barrels of various salts and carboys of acids, but none of those were broken. On top of the pile stood three roundish flat crystal flasks of nearly black liquid. He recognized them as containers of an iodine solution—also harmless.

Before going to assist his man in reviving the stricken umpires, Bullard opened his face plate by a tiny crack and took a cautious sniff. Ah! That sickly sweetish odor was strangely familiar. And as a queer ringing in his ears began he snapped his helmet shut and fumbled for his oxygen valve. He kept a firm grip on his consciousness; he knew that in a second his momentary giddiness would pass, for the whiff he had had was nothing more noxious than nitrous oxide. But where was the N_2O coming from, and how much of it was there?

He sprang to the bin holding the ammonium nitrate. To the eye it was normal, yet his reason told him it must be the source of these fumes. He moved closer to it and was suddenly aware of a warm spot between his shoulder blades. It was as if he

had stepped in front of a firebox door. He wheeled to see the source of the heat, and saw—only the three flasks of iodine, and behind and beyond them the lazy smoke of the dying flare.

His bewilderment left him with a rush. The situation was transparently clear. The iodine flasks, shaped as they were, were acting as focusing lenses for the infrared rays from the smudge bomb, concentrating its weak heat until it was plainly perceptible. Under the influence of that mild heating, the ammonium nitrate had begun to break down and give off the nitrous oxide fumes. Now he understood the lunatic behavior of the magazine man before he shut his face plate, and why the umpires were lying unconscious about the place. He flung himself at the iodine lenses and dashed them to the deck. Then he leaped to the atmospheric control valves on the bulkhead and stepped up the amount of oxygen entering the compartment. He called to Benton in the tube room and ordered him to hook up the storage batteries hitherto held in reserve, and put power on the blowers. He must clear the magazine of the "laughing gas."

"LAUGHING GAS!" The antics of the inspecting officers! Now it began to make sense. He shot a glance at the open voice tubes and knew in that instant, what had occurred. And knowing it, he shuddered to think of what might be going on above. The nitrous oxide, being heavier than air, was naturally flowing through the open tubes toward the control room and the other compartments clustered about the ship's center of gravity. All those unhelmeted officers, those of the *Pollux* as well as the Castorian inspectors,

would be tipsy at the very least. Perhaps by now they were dropping unconscious. Bullard snapped shut the gastight voice tube covers and shouted warnings into his helmet phone to his other men throughout the ship.

"Too late," came back Benton's report. "They're acting like crazy men—but how was I to know? I couldn't smell and I thought it was all part of the game. Only now—"

"Only now what?" snapped Bullard, his heart sinking.

"Well," reported Benton, hesitant to quote so august a personage as the Commander of the Jovian Patrol Force when the latter was in an uninhibited mood, "the admiral came dancing in and slapped our captain on the back and said, 'Let's make it a good party,' and Captain Mike said, 'Sure! You've overlooked a lot of bets—'"

Bullard groaned. The stuff must have seeped into the wardroom, too.

"Then they all laughed like hell and began busting things."

Bullard listened dully as Benton recited the list of outrages. Cables had been torn out bodily, others crazily connected and short-circuited; controls were smashed and the needles on gauges twisted to weird angles; in short, they had raised hell generally. The hilarious victims of the gas had made everyone—and more—of the invented casualties a grim reality. Now the ship *was* out of control.

"Keep shooting the oxygen to them," yelled Bullard. "I'm on my way up."

Benton had not overstated the case. The CC, Plot, subplot and the engine spaces suggested the wake of a terrestrial typhoon. The decks were cluttered with controller handles, broken dials and tattered paper.

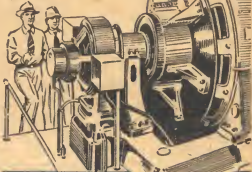
They had even torn up the astragalional tables and the log. From the bulkheads dangled the stray ends of leads and bashed-in indicators. The place was an unholy mess. And all about sat the drooping officers who had done it, too groggy by then to do more, but still staring about with imbecilic expressions.

There was no use crying over spilt milk. Outside was the threat of Jupiter, more ominous than before, and Bullard was reminded of it as he felt the thrust when the six old-fashioned liquid-fuel tubes fired their first blast. Good old Benton! Despite the madhouse raging about him, he had persevered with the task assigned and had got them to firing. The ship lurched in reaction and with the lurch many of the dizzy observers were flung to the nearest bulkhead. The busy hospital corpsmen, darting among them with their first aid kits, had a fresh problem to cope with. Some of their patients were doubly unconscious.

Bullard might have been more concerned with the comfort of his stricken seniors, but hard on the heels of the success in getting the tubes to blasting came a new casualty, and an utterly unforeseen one. A strange throb shivered through the ship and she began to tilt unaccountably, and with it came a violent side-wise oscillation that made the skin crawl. A still conscious umpire huddled in a corner gave way frankly to his nausea; dangling wreckage battered against the bulkheads while the rubbish strewn about the decks shifted back and forward like the tides of the sea. The din and clatter of it was unbearable.

Above it all rose the shrilling whine of runaway motors. As the wild and sickening oscillations increased in amplitude it became painfully apparent that something was happening to the massive whirling gyros at the heart of the vessel.

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Bullard fought his way toward them, clinging to such projections his hands could reach and dodging the missiles of debris flung about by the bucking ship. In time, he reached the armored door of the gyro housing and by then he had gained an inkling of what had gone wrong, but the remedy for it was not so obvious.

In their drunken orgy of devastation, the umpires had broken the leads feeding the motor field coils, and the gyros were running away—but at unequal rates, probably due to the inequalities of their own bearing frictions. Bullard knew, of course, that he could cut off the armature current, but if he did that the acceleration would shortly be reversed. Should the gyros be slowed rapidly, their rotational momentum would be transferred to the ship and force it into a dizzy whirling, a condition the crew could not endure. Bullard had scant hope of being able to restore the field current. Finding the breaks among the tangle of wreckage would take hours, whereas he had only minutes available, and not many of those.

"SEND me a man and plenty of stray cable," he called to Benton, "and I want juice up to the gyro housing from the batteries."

Bullard was looking at the steel columns that held the bearings of the gyro axles—six of them, in pairs, each pair at right angles to the others. What he could not do by electrical resistance he would do by friction. If he could regulate the bearing thrust, he could keep the speed of the gyros under control. It had looked hopeless to him at first, for there was no way to insert the huge jacks they had on board, but he had thought of a way that was at least worth a trial.

"Throw the end of that cable around there," he directed, "and make a coil—a helix—around that

bearing column. I intend to magnetize it."

The man—one of Fraser's—did as he was told, but the unbelief in his face was easy to read. What difference did it make whether the thrust columns were magnetic or not?

"That's well!" shouted Bullard, when the last of the six had been wound. Then he ordered current—a weak current, but under his instant control by means of the rheostats he had had inserted in the lines. It had been a tough job, getting that far, for all the while they had been flung this way and that as the whirling masses of metal fought to take charge of the battered cruiser. But Bullard and his helpers had hung on, and now was to come the test.

He was rewarded, after a little, by the halting of the steadily rising crescendo of the motor wail. At least he had stopped the acceleration. Now all he had to do was bring the three into harmony.

"You've got the idea," he said to the principal electrician who had been helping him. "Keep monkeying with them until they are all together. The bearings will get hot, but we can't help that. Flood 'em with oil, and if that don't do it, send down for some liquid air. Whatever you do, don't let 'em freeze, or we'll be flung clear out of the System."

"Aye, aye, sir," said the man, "but how did we do it?"

"Magnetostriction," Bullard explained, as he prepared to slip from the compartment. "A little magnetism makes steel expand, that's all. If your bearings get too tight, give 'em either more juice or less, and you'll shorten those columns."

Bullard slid out of the housing and picked his way aft. He wondered

where they were by now and whether they would win their fight with Jupiter. He could feel the surge of the ship as the six flaming tubes drove it, and knew from his sense of weight that they were pulling out—but how fast?

BENTON looked worried. His tubes were behaving wonderfully, but they lacked power for the job imposed. The *Pollux* was checked in her fall, and that was all. She needed more kick to escape, and Benton did not dare apply it. Bullard came and looked.

"Can't be helped," he muttered, "give 'er the works."

"They'll melt," warned Benton.

"Let 'em," said the youthful acting captain, with grim finality. "We can't be any worse off."

Benton shrugged, and began the doubling of his fuel lines. Others of his men scurried off to storerooms and presently came back, lugging spare injectors. Those, after a few minutes of frenzied work, were coupled with improvised superchargers and inserted into the new fuel into the laboring tubes, the *Pollux's* wake bloomed from a mere meteoric streak of ruddy fire to the whitely dazzling fan of a Grade A comet. Her determined masters piled gravity after gravity onto her acceleration, building her up until her men could stand no more, despite copious injections of *gravonol*. Harried hospital corpsmen had been pulled off their work of salvaging the unhappy "dead" and the Castorian umpires long enough to administer those precautionary shots.

Presently a sobered and grave-faced chief umpire—Captain Allyn of the *Castor*—staggered into the tube room, supported by two of his junior officers. All of them looked the worse for wear, bruised and cut as

they were and only partially bandaged, but at least they had managed to get onto their feet. Like everyone else, while still woozy from the effects of the gas they had been badly flung about during the bout with the rebellious gyros.

"The admiral says," Captain Allyn announced, "that all imposed casualties are rescinded. Cease present exercises and return to base."

"Like hell he does!" snorted Bullard, flaring with resentment. "You tell the admiral he lacks authority to rescind the casualties I'm contending with. You can tell him that I'll get out of here how, when, and if I can; and that it will be time enough after that to talk about ceasing something and returning somewhere. In the meantime, kindly get out of that man's way. He has real work to do."

Captain Allyn opened his one good eye in blank astonishment, but he stepped to one side and let the burdened tube man pass with his armful of fresh spare parts. The skipper of the *Castor* looked from the angry young man in his soiled and torn uniform to the chaotic tube room about him, and then back again. He had not realized what a pass things had come to. There were no instruments of any kind in working order, either astragational or engineering. These sweating, strained-looking men could only guess at the pressures, voltages, amperages and the rest that they were dealing with. Now, if ever, a man had to have the feel of a ship—and this one had an awkward feel, a terrible feel. It was the sickening feeling of doom.

"THERE goes the first one," remarked Benton calmly, as the ship shuddered and gave a little jump. They felt, rather than heard, the increased roar outside, and a white-

faced man sitting astride the smoking supercharger in No. 4 tube feed-line frantically fought to close the valve beneath him. The first of the overtaxed liners had reached the ultimate temperature—had been volatilized and sneezed out into Jupiter's face. Benton's voice was quiet and the lines about his chin unquavering, but there was anxiety in his eyes.

"Hang on," said Bullard. "We can't ease off now. The others may be tougher. We're going uphill now—if they'll only last half an hour we'll be over the hump."

Captain Allyn and his two aids discreetly withdrew to a corner of the tube room. He was too competent an officer to meddle, now that he had some understanding of the situation, and he could see that this dirty-faced lad knew what he was about. He contented himself with putting a few additional entries into his already crowded notebook.

It was nearly twenty minutes before the next tube collapsed to be hurled into the wake as a cloud of vividly incandescent vapor. That was No. 3, and five minutes later went No. 1—and almost simultaneously with it, No. 6. But the other two held out until they reached the crest, and beyond. The critical point was passed, judging by the feel of things, and the order was on Bullard's lips to cut the blasts by twenty percent when one of the remaining tubes let go, too. That left but one, all the motive power the ship had, and that woefully inadequate, but at least they were moving outward into the clean, dark depths of the ether. Bullard cut its output hastily until it was down to normal, wondering hopefully as he did, whether they were out of the woods yet.

He left the oppressively hot tube

room to Benton and his gang and went out into the disordered ship in search of an altiscope. For minutes he struggled through cluttered passages and choked trunks, looking into the now deserted turrets and other fire-control stations for an unsmashed instrument that bore. It was in the topsy-turvy wreckage of the torpedo room he found one, and it was with a sense of almost dread that he put his eyes to it and took a squint at Jupiter. Then his heart leaped with joy and relief, for the great rose disk took up only part of the telescopic field and as he hastily read the graduations along the cross hairs he saw they were out of the worst of its gravitational field. In fact, they must be not far from the orbit of the small satellite that was their destination.

Bullard whirled the altiscope until he brought the tiny iron body into his field of vision, and the moment he sighted it he began barking orders to his men back in the tube room. They must turn now, and with their single good tube and the five frayed and oversized ones, and buck their own forward momentum. The problem had shifted from the desperate need for acceleration to the necessity of checking their flight. To conform to the terms of the admiral's order, they must land on that barren lump of iron.

SOMEHOW they did it. It may have been four hours later, or six, for time had ceased to have meaning, when a haggard and very dirty young lieutenant and the exhausted remnants of his crew staggered out onto the black plain of Jupiter's inmost satellite. They wasted but a moment in staring up at the huge hulk that had brought them there. Outwardly, she was the sleek, powerful cruiser that she had been the day before, however disarranged she might be inside, but they were not

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concerned with her general appearance. They had come to inspect the damage done to her after hull by the disintegration of the tube liners. Was it irreparable? And what sort of terrain lay beneath the now helpless *Pride of the Skies*?

For Lieutenant Bullard was not content with merely having escaped the grip of Jupiter. As he understood it, he was in temporary command of the *Pollux*; and of the tactical problem assigned only the first leg had been completed. He must get off this rock next and take her back to Ursapolis and set her down in her launching cradle in the yard. Benton shook his head gloomily. There were no more rabbits in the hat. To sit down on Callisto they would need not one tube but three, and at that, the maneuver was sure to be jerky and full of risk.

It was while these two were in their huddle, talking over ways and means, that the admiral and Captain Dongan found them. Allyn had roused them and told them where to look.

"Well done, Bullard," said Captain Mike. "The admiral has promised you a special commendation. Tell me now the exact condition of the ship and I will relieve you. The first thing the admiral wants is a jury-rigged radio so we can have tugs come out. As soon as that is done you may go and rest. I'll take charge now."

"No, sir," protested Bullard hotly. "I demand the right to carry on. They have put us into this mess as a test. Well—the test is not over yet. According to the rules, if we call for help, we lose. We can't—"

"We have not lost," said Captain Mike, quietly. "The problem has been canceled. Unforeseen developments—"

"Yes!" cried Bullard, his voice almost a scream, he was so outraged

at the implications, "that's just it—unforeseen developments, and the *Pollux* couldn't take it! That is what the sky fleet will be saying and laughing at us in every mess from Pluto to Mercury. If we let 'em call this thing off now, we're all washed up and done as far as being the best ship in the whole—"

Bullard was a bit hysterical and quite unaware of his seeming in-subordination. He had been through a lot and his nerves were frayed and jumpy, but for hours now he had concentrated on this dilemma and he was in no mood to be shoved to one side. It was up to him to find a way out—he *must* find a way out, one way or another. Any other solution would be to let the *Pollux* down, an admitted failure, and that was unthinkable. After all, what was this unforeseen development that had wrecked them? Nitrous oxide! So what? That was a legitimate hazard. It could have been generated under other and more normal conditions and would have had to have been dealt with. To call off this test now would be simply to take refuge behind an alibi, and a weak one at that. Bullard was the one the umpires had chosen for the guinea pig and he couldn't quit. As he saw it, not only was the reputation of the ship at stake, but his own personal honor.

Hot words poured from him, reckless words—mutinous sounding, but Captain Mike listened, gravely. He looked at this lieutenant of his thoughtfully.

"I like your spirit, Bullard, but that is beside the point. There is no way out now. It is too late. As for your reputation, have no fear—"

"Oh, that's not it, sir—" Bullard was on the verge of tears.

"Let the boy have his way," interposed the admiral. "His stand is the

correct one. Personally, I think we're wasting time, but I won't have it said that I denied justice to any man. If he thinks he can pull out of here, let him try it. I will allot you twenty-four more hours to carry on the problem, Bullard, and during that time you will have no interference. Good luck!"

IF BULLARD'S tears had been close to the surface from rage and anger, the reason a few dribbled down his cheeks now was a different one. His first emotion was jubilation. But in a moment that gave way to a sense of awe as the full implication of what he had assumed made itself apparent to him. He realized that in insisting on carrying this problem to its conclusion he had put both himself and the *Pollux* on the spot. Before, they had at least an out—a plausible and an officially acceptable alibi. If he failed now, the ship failed with him. Remorse smote him. Had his vanity led him to compromise the name of this ship he had become so attached to? It was a sobering thought. Now he knew as he never had before, that he must succeed. Not until the *Pollux* was snugged down in the yard could he rid himself of the responsibility.

That thought was all the bracer he needed. As by a miracle, his fatigue dropped away from him, and by a few terse words he managed to convey to Benton and his helpers somethings of the same fiery spirit that animated him. To a man, they knew that excuses would have no value—they must deliver.

It was an interested group of spectators who thronged about the grounded cruiser. By common consent the rules had been relaxed to the extent that the "dead" could look on and converse, provided only they did not interfere. From the

deceased Polliwogs came words of cheer—the whole crew was rooting for them, while now and then a Castor Bean would relieve himself of some wisecrack at the expense of the toiling repair men. The admiral, for all his magnanimity, was fretful and impatient. He had a dinner date with the Governor of Callisto for the following evening and it annoyed him to think he might not be there. The Castorians, too, were anxious to get back to the yard. They yearned to get aboard their own vessel, for in the last few hours they had learned there was much to do to that fine ship. Her inspection—by the Polliwogs—was set for the following week.

Bullard doggedly disregarded them all. He had opened a cargo hatch along the keelson and from the nether hold his men had dragged five huge cylinders. Using heavy tackles, they ranged them alongside the *Pollux* in the wan sunlight of the Jovian System. Farther aft, heavy tripods had been set up and diamond-pointed drills were biting into the native iron of the little satellite. Other men were high up on the sternpost, driving portable reamers into the ragged tunnels of the tube housings. Chinnery and Roswell, chief engineers respectfully of the *Pollux* and *Castor*, stood by, watching.

Chinnery evinced no joy at seeing this young officer from the gunnery department making bold with his spare stores, nor did he take pains to conceal his contempt for this latest effort.

"Spare bushings for the old-style tubes," he explained to Roswell. "I forgot I had a set. But they won't do him any good. They're oversized. We carry 'em because they are too big forgings to pick up anywhere, but it takes a well-equipped

yard to put 'em in—they have to be pressed in, you know, to a tight fit."

Roswell nodded. As a rival, he was quite willing to see the job miscarry. Up until then, the *Pollux* had parried every one of his devastating casualties. He was hoping they would muff this real one.

But Bullard neither knew nor cared what they were saying. He and Benton were on top one of the huge tubes, manipulating a gigantic pair of calipers. They already knew they were oversize, and their plans for pressing them in were at that very moment in the process of execution. Astern of the ship a group of holes had been drilled into the iron, and now the men had substituted fat taps for the drills. Those who had originally brought the tubes out of the storeroom were back within the ship, rousing out hundreds of fathoms of high tensile chain—carried for the rare emergency of a heavy tow.

The men up in the tubes reported their job completed, but Bullard frowned when he read the finished diameter. It was too little. He wished ardently for a giant lathe so he could take a cut off the massive tubes. But there was no such lathe nearer than Ursapolis. He would have to reduce the outer diameter of the bushings some other way.

He bled air from the ship through outlets on its shady side, and collected the liquefied gas in buckets and doused the tubes with the cold liquid air, but even when they had shrunk to their minimum size, they were still too large. It was a disappointment, for he had little time to spare for the actual work ahead and none at all for experimentation. The tapping of the holes was done, and now men were already setting the heavy eyebolts and reaving the chains through, ready to hold the

ship against the thrust of the great hydraulic jack he had placed astern of her. But still the tubes were too fat. If the ram was strong enough to force them in, the chains would part. He must reduce the resistance, but he saw no way to do it now except to heat the tubes, and that he was reluctant to do, for his tank soundings showed he was already dangerously short of fuel. They had expended it lavishly in their escape from Jupiter. There was barely enough liquid hydrogen to get them off the satellite and on their way to port, with a small margin over for the landing.

Benton shook his head when questioned as to possible sources of substitute fuel. All the uranium had been lost overboard when the feed pipes were broken with full pressure still behind the fuel supply. That had been necessary at the time, and it was fruitless to waste regrets on it now.

Bullard sat down and explored the ship mentally, checking off one by one, the contents of the storerooms. There was nothing he could use that did not have some drawback. *Ammonal* there was plenty of, but he had doubts as to its safety. Then, suddenly, the solution hit him.

"Go ahead and set your first tube," he directed; "No. 1. Then send all the men you can spare into the nose blister—break out a couple of tons of that steel wool. That's what we will use."

IT MADE a pretty blaze, that tube housing stuffed with steel wool saturated in liquid air, and a short one. Under the terrific outpouring of heat, the tube reddened and swelled, and the ready nose of the first of the bushings was jockeyed into the mouth of the tube and the great jack set in motion. Upward it drove, the ship straining against her leashes,

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but the pad-eyes set in the hard, planetary iron held, and the quivering *Pollux* had to receive her bushing. There was no evading the thrust of the ram.

One by one the other bushings were run in and rammed tight, and as the surrounding housing cooled, its contraction crushed the liner to as tight a fit as any yard in the Solar System could have achieved with all their fine equipment. Bullard had no misgivings as to their reliability. They would stay in place.

He was an hour ahead of schedule when the last tool was back on board and the warning howlers announced the imminent take-off. The *Pollux* spouted flame—old-fashioned flame, such as the *Asia* still used—then roared upward on her homeward flight.

"Send this, please," the admiral crisply commanded the tired but contented acting captain of the *Pollux*. Bullard looked at him in surprise. The radio had been repaired, but why did he want to send a signal? No one needed a tug now. They would be in in an hour—long before any tug could be warmed up. But he took the signal, since the admiral had offered it, and read. It was addressed to all ships and stations and began, "I have this day inspected the cruiser *Pollux* and find her ready in all respects for any contingency of the service—"

The first casualty of the trip really to hit Bullard occurred at that point. Something went wrong with his eyes, and for a moment the message in his fingers was just a blur. He saw the words "special commendation," and a mention of a Commander Bullard, and by then he had reached the familiar signature—Abercrombie. He did notice that the ship's score was a flat four-o, and at the moment that was all he cared about. She had made the grade.

THE END.



BRASS TACKS

You know, it's surprising how few violent arguments arise from these lists of "ten best." There's certainly darned little agreement.

Dear Mr. Campbell:

Looking over the letters in the February issue reminded me that I had neglected to send in my list of ten best stories for the year 1939. That, of course, will never do. After all, editors and readers need some expert guidance as to excellent yarns, and who is more expert than I? (I hurry on without pausing for an answer, because I can detect that fendish look that comes over Editor Campbell's face when about to give me his opinion of the tripe I cook and call—*heh, heh*—stories.)

Here goes:

For year 1939, I nominate the following ten stories as the best of the year:

- 1—"One Against the Legion".....Jack Williamson
- 2—"Lifeline".....Robert Heinlein
- 3—"Gray Lensman".....E. E. Smith
- 4—"Cosmic Engineers".....Clifford D. Simak
- 5—"Day Is Done".....Lester del Rey
- 6—"Rope Trick".....Rando Binder
- 7—"Nothing Happens on the Moon" Paul Ernst
- 8—"General Swamp, C. I. C."

Frederick Engelhardt

- 9—"Rust".....Joseph E. Kelleam
 - 10—"Smallest God".....Lester del Rey
- It's a nice scattered list, isn't it? Del Rey is the only one who repeats. The only thing that bothers me is that L. Sprague de Camp isn't on it. He's got a pair of five-star articles printed during 1939, but I'm considering only stories. However, if you want to see him done justice, wait until you see my list of ten best of 1939 for *Unknown*.

Of course, Astounding makes it tough on the ten besters among us fans by printing so many good stories that it's a shame to give ten credit and let the rest go. Can you imagine any other magazine in which yarns like "Ether Breather," "Mittie" and "Black Destroyer" would not be included in the first ten? 'Sa dirty shame.

Voire from the gallery: "Hey, Asimov, where did you put 'Trends'?" Asimov refuses to answer.

A word to C. J. Fern of Hawaii: When I say a person can get used to any odor—I mean

odor. Ammonia can't be stood not because of its odor but because of its irritating action upon the nasal membranes. The same can be said for sulphur dioxide and hydrogen chloride. By odors, I mean such stuff as the smell resulting from acetic acid, or hydrogen sulphide, or carbon disulphide. And just to show you the power of adaptation, listen to this. A fellow a few desks from me in lab about a month and a half ago was synthesizing caproic acid— $C_6H_{13}COOH$. The odor, Mr. Fern, is indescribable—it is the worst thing I ever smelled. The faintest traces affected me so strangely that I couldn't, for the life of me, work at my desk. And yet the fellow synthesizing it, after suffering for quite a while, finally reached the stage where he found he could stand it. He never liked it, but he could stand it. The net result was that he, right on top of the damn stuff, sang songs merrily, while I, ten feet away, who caught only vagrant whiffs and hadn't time to get used to it, went bitterly and howled in despair.—Isaac Asimov, 174 Windsor Place, Brooklyn, N. Y.

'Fraid Rogers isn't a professional tank designer.

Dear Mr. Campbell:

I see that another cover by Rogers adorns the February issue. It is a perfect example of what a science-fiction cover should be. You would know it was a science-fiction magazine even without the title. It is perhaps the best cover by Rogers to date, though I can spot several technical errors. The treads on the tank are spaced too closely together for stability, and the tank would be inclined to tilt or even topple over sideways. The treads themselves are too narrow to support the apparent tremendous weight of the tank, and would, I believe, sink into the ground. The guns, too, are too few and not flexible enough to be used to an advantage. However, a squat, wide-treaded tank would spoil the smooth lines and superb balance of the picture. The rocket ships are, as usual, simple, sane and practical. In future let Rogers do about seventy-five percent of the covers and reserve the remaining twenty-five percent for covers by Schneckman or astronomical plates.

The stories were all good. "Locked Out" and "The Professor Was a Thief" were excellent.

"If This Goes On—" certainly merits the Nova designation. I am eagerly awaiting the second installment.—Fred Hurter, Red Rock, Ont., Can.

Well—you can't characterize a light-year, anyway. When men do travel such distances, they'll do it casually because the mind can't handle it otherwise.

Dear Mr. Campbell:

I am one of those individuals who have "been reading your magazine for a long time, but have never written you before because—". And then some fool alibi to conceal the obvious fact that we're just too doggone indolent. I, however, have been pleasantly surprised out of my own lethargy by the all-around excellence of the February Astounding.

Frankly, Astounding has been rather disappointing, of late. While you had not sunk to thud and blunder levels—you have never done that—you were, nevertheless, maintaining a decidedly low standard, and though you still stood out like a shining beacon among the other unspeakables on the stands, you were not getting anywhere at a terrific rate. The shorts especially, were decidedly mediocre, while the longer material was—well—unexceptionable. I attributed it to Doc Smith's supercolossal. At any rate, the February issue was one fine pickup.

Speaking of Smith reminds me, by some strange coincidence, of the "Gray Lensman." After finishing it, I am unable to understand what all of the sound and fury is over. Just what causes science-fiction fans to get down on their knees and salami reverently when the name Smith is mentioned is beyond my quite feeble comprehension. His science is rather vague and seldom elucidated; he makes no attempt whatever to make those mind-staggering distances he reels off so casually believable, and as a consequence they aren't. Even Wells would have some difficulty creating an impression of the cosmic reaches he spans so easily. Smith makes no attempt to do so. He merely mentions lightly so many light-years and you can take it or leave it. As a consequence, he inspires only an embarrassed incredulity. That "Gray Lensman" was a darn good story cannot be denied. But it was not a classic. Neither was it a "great" story, in the sense of literary worth. It was simply, in the final analysis, a well written, very long and highly entertaining tale of the future. And if that be blasphemy, make the most of it.

I was delighted with the cover of the February issue. A striking cover like that, without a trace of the luridness commonly associated with the pulp mags, really attracts favorable attention and gains readers who ordinarily would not buy the mag. More!

Heinlein is really going places. He has a mastery of technical principles that is amazing in such a new writer. He is so convincing and logical, and so forceful, that it is irritating to reach the end of one of his tales. The thesis that he presents in "If This Goes On—" is not only interesting; it approaches fact a bit too intimately for comfort. The methods which the Spaniards used to—er—persuade the Aztecs to accept Christianity are not anything calculated to settle the stomach of a squeamish person. And the pop of punctured egotisms that went up with a terrific bang when the mad suggestion that the Earth was not the center of all the Universe was advanced was drowned by the shriek of heresy and satisfying sizzle of frying atomizers. Need I mention the inquisition of Salem? I think not, although the tribunal set up in the twelfth century for heretic hounding might stand special mention. No, it isn't the religion; it's the way you interpret it. A certain two-legged freak of nature

that calls himself Man is the factor that throws the entire business out of whack. A factor that no one has ever quite succeeded in eliminating.

"Locked Out." An unpretentious but clever short.

"And Then There Was One." Mellerdrammer. An old pulp plot set on a planet.

"Martian Quest." Shrieking violet proves himself to be a hero-by-destroying-monster-meance stuff. Why must these heroes behave like little Eve? They're about as believable as Don Wollheim.

"High Frequency War." Didn't believe a word of it. Well, authors must eat, I suppose. "Bombardment in Reverse." Glad to see Kalchak back. Thoroughly enjoyable.

The articles were fair.—Joseph Gilbert, 3845½ Park St., Columbia, So. Car.

How Astounding does get around

Dear Mr. Campbell:

I would be very much obliged if you could find space to print this little notice in your "Bossa Tacks" section.

Any Astounding reader in the Sydney, Australia, area who would be interested in organizing a science-fiction club is requested to contact William D. Venev, at the address given.—William D. Venev, 19 Newland St., Bondi Junction, Sydney, N. S. W., Aust.

Hm-m-m—how about it, Dr. Smith?

Dear Mr. Campbell:

I have a request to make of you which I think will be echoed by many readers.

In an editorial by your predecessor there was mention of the notes and calculations of E. E. Smith on each story that he writes. From this and letters, I have gathered the impression that Smith builds up a very complete theory as to the physical apparatus he uses so lavishly.

An article on this subject would be of great interest to us. It would also show how any theory is built up, taking the data that is interesting to the theorizer and building up a theory that fits it, leaving out features that don't fit. It would be very instructive to us all.

Congratulations on the science articles and on the opening of the field to new talent. It was certainly needed, and still is for that matter, but a very good start has been made.—E. Hutchison, Denison, Texas.

Yes—it's Aarn Munro

Dear Mr. Campbell:

"If This Goes On—" is the most exciting thing since "None But Lucifer." Heinlein should write a handbook for revolutionists. The information on propaganda should be useful, and, oh, how valuable!—If the readers would only abide by it. I've already derived much interesting information from that story. It might come in handy some day, if things go on—

Your magazines seem to be stabilizing in form, with one brilliant story per issue surrounded by a group of very mediocre ones. It makes it easy to pick the best one, but then you have to fight for the rest.

Give "And Then There Was One" second place for this issue. An old idea, but nicely done. However, a letter by someone like Malcolm Jameson figuring out the orbits of the leaping men in the rotating planet would be very interesting. I don't think Rocklynn got it right. He disregards inertia and such things. Angular momentum, et cetera.

"The Professor Was a Thief." Perhaps a screwier professor, but not a better story than the "Dangerous Dimension."

"High Frequency War." A bit on the senti-

mental side. Watch out for superfluous flag waving. Always leads to destruction.

"Bombardment in Reverse." A famous author returns to us. Too much in the beginning and not enough in the end.

"Locked Out." A tremendously powerful situation muffed by unskilled writing.

"Martial Quest." The critic needed Alka Seltzer.

The articles are very good. Willy Ley's is less forbidding than most of his are.

So they're voting for the best of the year now. It seems like just last week that the Philadelphia Science Fiction Society decided among themselves the ten best stories of 1938. I remember that Astounding had well over half of the ten.

This year I am in a quandary. I don't know whether to give first place to "Gray Lensman" or "None But Lancelot." The two are so utterly different that it is impossible to match them, so I'll compromise by giving them a tie vote. As for the rest, I don't have the major part of the magazines at hand, so that's as far as I'll go.

What is this guy Koll, a werewolf? His changes of style begin to get confusing. He couldn't be Wesso, could he? And if not, what has happened to Wesso?

And what is this Iron Munro I see advertised with Shadow Comics? Not our old friend Aaron Munro? Congratulations upon getting into the funny papers.

In just a few weeks it will be exactly ten years since I started buying science-fiction magazines regularly. Ten years gone, and so for the next decade. What will it bring?—Milton A. Rothman, 2020 F, N. W., Washington, D. C.

Heinlein has several more yarns coming up.

Dear Mr. Campbell:

It has been a relatively long time since I've taken quill to your address. The last time, if I rightly recall, I had not much to say in favor of Astounding Science-Fiction, and if I do say so, at that time—about June, I believe—I was justified in my arguments; but I have since had cause to change my mind, and for that reason you receive this missive.

I have just perused fully the February issue of ASF, and glancing back over the last few months, I have this to report:

Definitely, you have improved! Now, before I go any further, I desire to make it plain that when I say you have improved I mean you have improved. I waste no praise on a magazine.

Edward Elmer Smith, while not up to par with his other epics, still retains his individual characteristically to make a story live. And "Gray Lensman" did live! I noticed a few items that rather irked me, as I intimated when I said his story was not up to par, and those few items might be termed as: banal scenes, no true epic action and too much beating around the bush. Especially do these items apply to the first half of the story. Undoubtedly, the first two chapters lacked the Smith adept touch. But the latter half was better.

The illustrations were the worst that have ever adorned a Smith story. Mr. Campbell, I, like most of the other ardent readers of ASF, implore you to get a few decent artists back on the staff. Please can the kid boys, Gilmore, Kramer, Kolliker, Gladney, et. cetera. Rogers is a fair artist, but he definitely dwindles before Doid, Wesso, Paul and Binder.

Stories have been improving generally. The best of the new authors is undoubtedly Robert Anson Heinlein. This author will go far. I have a very interesting article on Robert Heinlein, by Forrest J. Ackerman, in my printed fan magazine, *Sterndust*, for May.

"If This Goes On..." is a very promising story. It is not epic, but it is good. This brings me to a point I have wanted to discuss for some time. I dislike your policy of Nova stories in two ways. For one thing, you don't give us enough of them—and for another, "A Matter of Form," the first of the Nova stories, was a poor example of a different story. It was



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naquestionably one of the poorest stories I have read in some time. But Robert Heinlein promises to make up for H. L. Gold's deficiencies. H. L. Gold is a mystery writer, not a science-fiction or fantasy writer. I do not like his stories.

One of the best stories I have read in a long time was “The Smallest God,” by Lester del Rey. A truly remarkable yarn, which calls for a sequel! The best story in the present issue is “The Professor Was a Thief,” by L. Ron Hubbard. It is one of my favorite authors. Please get some more “Arabian Nights” yarns from him for *Unknown*. “The Ultimate Adventure” and “Slaves of Sleep” were two of the most fascinating novels I have ever read! Ditto Norvel W. Page's “Prester John”! Please, some more!

Here is a list of your best authors:

1. L. Ron Hubbard, Lester del Rey, D. L. James, Robert Heinlein, L. Sprague de Camp, (of course E. E. Smith), Norvel Page, Don A. Stuart (except for “Elder Gods”), and a host of other lessers. Stick to these boys.

Your art staff, as I said previously, is poor. Clean it out, and redecorate with Doid, Wesso and Binder.

Well, till next I see you in *Astonishing*, I am—W. Lawrence Hamling, Editor *Stardust*, the magazine unique, director CSFL.

Another ten best.

Dear Editor Campbell:

Since the year of '30 has terminated I feel the time to tell my likes and dislikes throughout the year. Going through my collection, I have picked out the best stories, drawings and covers, also the worst. And I am pleased to say that the “good” far overshadow the “bad.”

Best stories in order:

1—“Look Of Aszir,” by Don A. Stuart. Superbly written and a well-worked-out plot.

2—“Crucible Of Power,” by Jack Williamson. Jack's always good. He's due again.

3—“Greater Than Gods,” by C. L. Moore. Miss Moore has a supremely good fantasy style. She writes too seldom for *Astonishing*, though.

4—“One Against The Legion,” by Jack Williamson. Almost spoiled by Orban's cartooning. “The Legion Of Space” was the only Legion story that was decently illustrated.

5—A tie between “Black Destroyer” and “Discord In Scarlet,” by A. E. van Vogt. If this author continues this pace, he'll be a top ranker in no time.

6—“Cosmic Engineers,” by Clifford D. Simak. Perhaps this should rate higher, but it's hard to class it with the other stories.

7—“The Morons,” by Harl Vincent. Because it's different and well worked out.

8—“The Luck Of Ignatz,” by Lester del Rey. Enjoyable.

9—“Maiden Voyage,” by Vic Phillips. Where is he?

Worst stories were “Blue Men Of Yraan” and “General Swamp, C. I. C.”

As a whole the best illustrations were done by Wesso and Schneeman. And as a whole yours is one of the worst illustrated mags in the field. Why don't you remedy this? Principal kinks are: Flek's for “Revolt,” Orban's for “One Against The Legion” and Gilmore's in general. Best covers were Rogers' for “Gray Lensman.” Worst was Gilmore's for “Discord In Scarlet.”

The reason “Gray Lensman” isn't in the ratings is because I haven't finished it yet. Anyway it's in a class by itself and I don't think it fair to rate it with the others.—Tom Wright, Editor *The Comet*, R. F. D. 1, Box 129, Martinez, Cal.

Due to lack of room Science Discussions is being held over until next month.

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